THE DEVELOPMENT OF AN INTERFUNCTIONAL NETWORK FOR THE IMPLEMENTATION OF THE DEPARTMENT OF DEFENSE LOGPLAN

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THESIS

THE DEVELOPMENT OF AN INTERFUNCTIONAL NETWORK
FOR THE IMPLEMENTATION OF
THE DEPARTMENT OF DEFENSE LOGPLAN

by

Dean Edward Dilger
and
Terry Alan Fulton

December 1974

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The Department of Defense Logistics Systems Plan (LOGPLAN) is a document that constitutes the Department of Defense-wide, long-range plan for logistics systems improvement during the 1975-1980 time frame. The LOGPLAN contains a number of implementing actions for these logistics systems improvements which must be initiated during this time period. The purpose of this paper is to develop and evaluate a model which determines relationships among the one hundred fourteen implementing actions and arranges them into

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The Development of an Interfunctional Network for the Implementation of the Department of Defense LOGPLAN

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I. INTRODUCTION

A. BACKGROUND

The Department of Defense Logistics System Plan (LOGPLAN) is a document which constitutes the initial phase of a Department of Defense-wide, long-range plan for logistics systems improvement. It complements the Five Year Defense Program (FYDP) by serving as the Master Plan for guiding the respective Department of Defense (DOD) components in the development of their future logistics systems.

The Congress, Office of the Secretary of Defense (OSD), and other DOD components have long recognized the desirability of a DOD-wide, long-range plan for DOD logistics systems development. Various trends, factors, studies, and considerations have contributed to this awareness. Within the OSD, studies such as the Defense Material Management Improvement Program (1961), the Responsive Automated Material Management System (1962), and the Progressive Refinement of Integrated Supply Management (1965) have highlighted the need for a more coordinated design of logistics systems to enhance their compatibility or degree of integration.[1]

In the LOGPLAN Profile [Ref. 1], reference is made to numerous General Accounting Office (GAO) reports which have

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[1]Department of Defense, Task Group 1-70 of the Logistics Systems Policy Committee, LOGPLAN Profile, Vol. I, June 1971 (FOUO), p. I-2.

been critical of the lack of standardization among Service and Agency automated systems, alleging that inefficiencies result from these differences. Furthermore, reference is made that Committees of Congress have used these GAO reports as one basis for recommending better planning, cross-fertilization of new concepts, and increased standardization of logistics systems. Finally, that the Services have discovered in many common supply support and interservicing applications that system differences have constrained their effectiveness.

To provide a mechanism for establishing DOD-wide logistics policy, the DOD Logistics Systems Policy Committee (LSPC) was established in 1970 for the purpose of developing a DOD Logistics Systems Plan (LOGPLAN). The LSPC membership is composed of the Assistant Secretary of Defense (Installations and Logistics) [ASD (I & L)] as chairman; the Assistant Secretary of Defense (Comptroller) [ASD (C)]; the Military Department Material Secretaries; the Military Service Deputy Chiefs of Staff for Logistics; the Director, J-4 (Logistics) for the Joint Chiefs of Staff (JCS); and the Director, Defense Supply Agency (DSA). Through the efforts of the LSPC components, the LOGPLAN has evolved as a documentation of key logistics assumptions, principles, objectives, and implementing actions for improving the DOD logistics system in the FY 1975-1980 time frame.

As stated in the foreword of the LOGPLAN:

> It (LOGPLAN) will serve as the Master Plan for guiding future logistics systems development throughout the DOD

and stresses the need for increased compatibility, interface and integration of Service and DSA logistics systems. 2

In August 1970, Mr. Barry Shillito, then Assistant Secretary of Defense for Installations and Logistics, before the House Subcommittee on Government Operations (Holifield Committee) said:[3]

> As a master plan for Department of Defense logistics systems, the LOGPLAN will be a documented collection of logistics concepts, objectives and subordinate plans. It will be open-ended and subject to continual up-date and will be designed to achieve the following objectives:
>
> 1. Provide a continuing approach to logistics systems development.
>
> 2. Communicate Department of Defense logistics systems objectives.
>
> 3. Promote optimum interchange of system design knowledge and techniques at all levels of the Department of Defense, and
>
> 4. Assure the highest practical level of systems compatibility, interface, and integration consistent with Department of Defense requirements and mission needs of the separate Department of Defense Components.

On 17 May 1972, Secretary Shillito in his forwarding memorandum of LOGPLAN [Ref. 4] to the Assistant Secretaries of the Services (Installation and Logistics), Director of Joint Staff, Joint Chiefs of Staff, and Director, Defense Supply Agency, added:

> The logistics elements contained in the LOGPLAN, although forward looking, do not present a radical change

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[2]Department of Defense, Logistics Systems Policy Committee, Logistics Systems Plan "LOGPLAN" 1972-1980, 15 May, 1972, p. I-1.

[3]LOGPLAN Profile, Vol. I, op. cit., p. I-6.

> in the direction of logistics systems. Instead, they reflect the projections of trends which are deeply rooted in logistics operations of the present and recent past, and which build upon a careful examination of future requirements and capabilities for effective support of the operating forces.

The most significant changes in future logistics management reflected in LOGPLAN are in the areas of control, visibility, flexibility, and communications. LOGPLAN encourages the introduction or expanded use of management techniques such as the use of new data and information systems, data banks, automation, simulation, and similar approaches.

Arthur I. Mendolia, the current Assistant Secretary of Defense (Installations and Logistics), similarly, in his covering memorandum for the third increment of LOGPLAN [Ref. 4] dated 12 June 1974, reemphasized that LOGPLAN is dynamic by stating:

> The LOGPLAN is designed as an open-ended document to ensure that it remains a viable, timely product which provides a continuing approach to logistics systems development.

Attesting to the importance of LOGPLAN is the fact that it was authorized as a time-phased plan for logistics systems improvement by the Department of Defense Directive 5126.43, "DOD Logistics Systems Planning" of 26 March 1970. Furthermore, on 17 May 1972, LOGPLAN became effective, thereby requiring DOD components to comply with its provisions.

B. STATEMENT OF PROBLEMS AND OBJECTIVES

At present, LOGPLAN contains 114 Implementing Actions (IA's) within fifteen functional areas. An account of these

fifteen functional areas as well as the respective number of IA's associated with each functional area is depicted in Figure 1. Quoting again from Secretary Shillito's memorandum of 17 May 1972:

> The LOGPLAN contains a number of implementing actions which must be initiated by separate correspondence. Action is now being taken to assign priorities . . . to these LOGPLAN actions.

In the past two and one-half years, attempts have been made by various DOD components to sequentialize the 114 IA's into a defined and coordinated plan. However, none have been accepted by the LSPC. Inherent problems in assigning priorities to the comprehensive spectrum of the IA's are centered about the general unrelated appearance of the broad logistics elements in LOGPLAN. Problems are posed in assigning priorities to unrelated IA's within each functional area. Compounding this is the difficulty in assigning priorities to generally unrelated IA's on an interfunctional basis. Possibly, another problem is that when Secretary Mendolia requested action to assign priorities in the quote shown above, the term "priorities" itself is open to different interpretations by those who are tasked to study LOGPLAN.

Webster defines "priority" as:[4]

> 1. the fact or condition of being prior; precedence in time, order, importance, etc.

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[4]Webster's New World Dictionary of the American Language, New York: World Publishing Co., 1972, p. 1131.

FIGURE 1

FUNCTIONAL AREAS CONTAINED IN LOGPLAN

Functional Area		Number of associated IA's
Logistics Doctrine	DO	1
Financial Management	FM	10
Logistics Systems Design	LD	15
Logistics Manpower	LM	2
Logistics Systems Research	LR	8
Material Management	MA	6
Movement Control	MC	9
Maintenance	MM	30
Organization for Logistics	OL	0
Productivity	PI	1
Procurement	PR	6
Supply Management	SM	12
Technical Data	TD	2
Transportation	TR	6
Weapons Systems	WS	6
TOTALS	15	114

To assign priorities to the LOGPLAN IA's using precedence in time or importance would, in the opinion of the writers, lead to several shortcomings; namely, subjectivity, personal bias, political pressures, and an ordering system that would likely accomplish ongoing or relatively simple tasks initially and postpone more difficult tasks into the long range. Furthermore, distinct relationships among the fifteen functional areas might be overlooked.

To prevent these shortcomings from appearing in this thesis, it was the opinion of the authors that "Webster's" precedence of "order" should be used as the criteria for assigning priorities to the 114 IA's. Therefore, the problem addressed in this thesis is the development of a model to determine relationships among the 114 IA's and ordering them into a logical and efficient progression for systematic implementation.

C. METHODOLOGY

The approach taken in the development of this thesis is the analytical process of systems analysis as described by Fisher in his book Cost Considerations in Systems Analysis. This process is similar to that employed in serious inquiry or investigation of problems in wide ranging situations.[5] In this particular systems analysis process, there are five basic steps which are outlined in Figure 2 on the following page. The first step (FORMULATION) involves the clarification of

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[5]Gene H. Fisher, Cost Considerations in Systems Analysis, American Elsevier, 1971, p. 8.

FIGURE 2

ANALYTICAL PROCESS OF SYSTEMS ANALYSIS

FORMULATION
(The Conceptual Phase)

SEARCH
Including the Development of Hypotheses
(The Research Phase)

EVALUATION
(The Analytic Phase)

INTERPRETATION
(The Judgmental Phase)

VERIFICATION
(The Testing Phase)

objectives, defining the issues of concern, limiting the problem, and searching out good criteria for choice. This step was enhanced by the fact that a letter from the Office of the Chief of Naval Operations [Ref. 14] had been received, requesting the assistance of the U. S. Naval Postgraduate School in developing an interfunctional plan for LOGPLAN implementation. Corresponding to this Formulation process is the discussion appearing in section B of this chapter.

The second step is the Search phase which involves data collection and analyzing of data to identify relationships as well as alternative programs of action. With respect to this paper, sources of information in the Search phase included LSPC generated memoranda as well as DOD, Service Secretaries, Navy Supply, and Navy Material Instructions and Directives relating to LOGPLAN. In addition, personal interviews and phone conversations were conducted with members of the LSPC and Navy Material Command representatives involved with LOGPLAN.

The third step outlined by Fisher is Evaluation which entails, "construction of a model for the situation and predicting consequences that are likely to follow."[6] Corresponding to this process, the authors developed a model of using students, involved in logistics, to investigate relationships and priorities among the 114 IA's. This Evaluation step is discussed in detail in Chapter III.

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[6] Ibid.

The next step in the analytical process is the "Interpretation" phase. This is also known as the judgmental phase and with respect to this paper, is also presented in Chapter III. It is described by Fisher as follows:

> Using the predictions obtained from the model and whatever other information or insight is relevant to compare alternatives further, derive conclusions about them, and indicate a course of action. [7]

The final step in the process is the Verification phase. According to Fisher, the Verification phase involves "Testing the conclusions wherever possible . . . to determine the model's validity."[8] Chapter V of this paper presents the writer's Verification of the method developed previously in the Evaluation phase.

D. CONSTRAINTS OF THE PROBLEM

Ideally, to determine the intra- and interfunctional relationships, experienced logisticians, familiar with each functional area would be required to study and interrelate the IA's. Naval Postgraduate School student resources were used in preparation of this thesis research, and their limited experience level and available number were by and large, the major constraint placed on the research efforts.

Additional constraints placed on the research efforts included time and accessability to information. With the

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[7] Ibid., p. 9.

[8] Ibid., p. 14.

exception of phone conversations with specific members of the LSPC and receipt of LSPC originated written doctrine, the data base for research information was limited to Monterey, California. Compounding this constraint, was the lack of travel funds.

A final constraint on the method of approach to the problem was a composite of the aforementioned constraints which resulted in the interpretation of the IA's. By design, the IA's were broad statements for implementing systems improvement goals. As such, they were subject to different interpretations as to objective, depth, and impact. Where the IA was not definitive in nature, its supporting specific objective was used to provide guidance in determining the objective of the IA.

E. OUTLINE

The material presented in this paper is divided into five chapters. Chapter I presented a brief introduction, and Chapter II follows with a detailed history of the events leading to the inception of LOGPLAN. Also included is a discussion of the elements that make up the entire LOGPLAN since this thesis deals only with the IA's. This is a very basic section and persons familiar with LOGPLAN, may find it beneficial to proceed to the next section.

The third chapter describes the model used to investigate relationships and priorities among the 114 IA's to develop the functional network. Included in this section are biases and

assumptions used in the development of this model. Also included is the presentation of the data developed during the SEARCH and EVALUATION phases of the analytical processes.

Chapter IV reflects the results and analysis of results of this thesis. Included in this chapter is the logical progression developed which organizes the Implementing Actions into an efficient network for systematic implementation.

Finally, Chapter V contains the conclusions and recommendations of this paper.

II. LOGPLAN DEVELOPMENT

A. HISTORY

LOGPLAN represents the latest in a series of laws and administrative actions that began shortly after World War II to eliminate waste and duplication in supply management. As a prelude to standardization and consolidation, joint procurement offices and a Federal Cataloging program were developed in the years immediately following World War II.

In 1955, the Hoover Commission recommended that Congress establish an agency similar to what is now the Defense Supply Agency (DSA). The response of the Secretary of Defense was the adoption of the Single Manager Plan, which broke the tradition of independent inventory control and distribution of material by each of the services. Under the plan, the Secretary of the Army was given total responsibility for all wholesale stocks of subsistence items, clothing, and textiles. The

Secretary of the Navy was given similar responsibilities for medical material, petroleum products, paint and steel.[9]

The Single Manager Plan allowed unification of supply support for given commodities within the framework of the existing organizational pattern. It enabled DOD to realize the economies and benefits of unified supply management with a minimum of disruption to the support of operating forces. Integrated material management began with 44,000 line items having an inventory value of 2.4 billion dollars.[10]

In 1961, the Secretary of Defense initiated Project 100. The Project 100 Study group developed three alternative plans of organization for management of common supplies and services:[11]

-Expansion of the Single Manager Concept

-Establishment of a common supply and service organization within one military department, and

-Establishment of a common supply and service organization directly under the Secretary of Defense.

As a result of the study the Defense Supply Agency was formed in 1961. It took over the existing Single Manager agencies, the Federal Catalog Program, and other integrated programs. From a base of the commodities already integrated under Single Managers, it expanded first into electrical and

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[9]Young, Everett B., LCDR, USN, "An Opportunity and a Challenge," in Navy Supply Corps Newsletter, Supply Systems Command, Navy Department, Washington, D. C., January 1972.

[10]Ibid.

[11]Ibid.

electronics material and general hardware, then into the multitude of commodities it now manages.

Establishment of DSA is a major step in the history of integrated item management. But integration of DOD supply systems goes far beyond item or commodity integration, for there has been a trend over the years to standardize management systems. One of the early reports aimed at management standardization was published in 1962. Known as RAMMS-68, it was a five-year plan intended to guide standardization of material management systems through automated data processing. Although the plan was not adopted as such, many of its features have been implemented.

Three years later, the Assistant Secretary of Defense (Installations and Logistics) released a report of a study it had sponsored entitled PRISM. PRISM emphasized standardization of supply cataloging.

The problems experienced by the Services in trying to implement the PRISM recommendations and parts of RAMMS-68 made it obvious that long-range logistics guidance was needed from the Office of the Assistant Secretary of Defense. Such guidance took four years to develop.

The General Accounting Office (GAO) studied the acquisition of data processing equipment for use in new computerized management systems. GAO confirmed the need for an over-all plan within the DOD to provide more adequate control over the planning, development and implementation of management systems.

LOGPLAN profile report [Ref. 1] indicates that upon publication of the GAO report, the Office of the Secretary of Defense expressed its intention to develop logistics systems guidelines to parallel the Five Year Defense Program (FYDP) which establishes for the military services, the approved force structure and financial plan for future years. This declaration marked the beginning of the current era of logistics system standardization and coordination within DOD. OSD's first step in development of the guidelines was the production of a Logistics Systems Blueprint, a series of concept papers for discussion at a conference at Airlie House[12] in late 1969.

At the conference, the Military Department Material Secretaries and the senior military service logisticians agreed to continue periodic meetings as a corporate body to guide the formulation of the DOD Logistics Systems Policy Committee--the LSPC.

The following year, the Joint Logistics Review Board studied the problems of the Vietnam buildup and called for scores of procedural and organizational changes.

At the same time, the President's Blue Ribbon Panel,[13] composed of Mr. Gilbert Fitzhugh and a group of leaders from industry, made some rather substantial recommendations to reorganize the Department of Defense, not only in logistics, but in other areas

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[12] LOGPLAN Profile, Vol. I., op. cit., p. I-3.

[13] Young, op. cit., p. 15.

as well. One of the many recommendations the Blue Ribbon Panel made in July 1970 was the establishment of a Logistics Command "to exercise for all combatant forces, supervision of support activities, including supply distribution, maintenance, traffic management, and transportation."[14]

The Secretary of Defense rejected this recommendation, saying that the objectives of the Blue Ribbon Panel report could be realized without formation of a Logistics Command.

Mr. David Packard, who was Deputy Secretary of Defense at the time, then published twenty-one objectives that he said would be incorporated in a Department of Defense Logistics Systems Plan. The objectives called for eliminating item management duplication, minimizing the number of items in the system, minimizing the number of inventory control points, and maximizing the reliance on support from integrated wholesale supply systems.

The inception of LOGPLAN dates to April 1970 when the LSPC assigned a task group to develop (1) a profile description of the emerging logictics system for the 1975-1980 time-frame and (2) a planning mechanism for the LOGPLAN. The task group included representatives of the four military services, ASD (I & L), ASD (C), JCS, and DSA.

The Task Group, appropriately titled (TG 1-70), prepared and submitted a three volume profile description report. The report proposed a description of the emerging logistics system,

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[14] Ibid.

primarily in the form of general and specific objectives to be accomplished in the 1975-1980 time frame and recommended LSPC actions required to attain the desired logistics posture. It included updated coverage of the assumptions, principles, and problem issues as well as reflection of the 21 Logistics Systems Policy Objectives for the period 1970-1975 approved by Secretary Packard on 15 January 1971.

The Profile report was distributed in June 1971 and staffed extensively by the organizations represented on the LSPC, including the military services. After several months, agreement was reached on a number of statements ranging from assumptions and principles representing the philosophy behind the LOGPLAN on down through specific implementing actions which would provide the impetus to achieve the documented objectives.

The LSPC's course in developing the LOGPLAN has been to charter task groups to study and make recommendations on logistics methods and management techniques. Although three increments of the LOGPLAN have been written and approved to date, future increments are anticipated. New increments will incorporate additional statements of policy recommended initially in the Profile Report, often after they have been exhaustively debated and extensively rewritten.

B. COMPOSITION

LOGPLAN is broken into four chapters, each representing separate elements as shown in Figure 3 on the following page.

The twenty-one Assumptions listed in LOGPLAN are statements about the near and mid-term environment in which the logistics

FIGURE 3

CONTENTS OF LOGPLAN'S FOUR CHAPTERS

ASSUMPTIONS
21

PRINCIPLES
6

GENERAL
OBJECTIVES
45

SPECIFIC
OBJECTIVES
92

IMPLEMENTING
ACTIONS
114

systems will operate or undergo development. They provide certain parameters on which the rationale is built to support systems improvement objectives. Assumptions address anticipated National and Department of Defense policies, resource availability, and the operational and technological environments where these characteristics are germane to logistics systems.

Following the Assumptions are six Principles which serve as a foundation for proposed improvements. They represent fundamental logistic truths and deal with such matters as organizational relationships, roles and missions, and accepted management practices.

LOGPLAN contains forty-five General Objectives which set forth broad goals. They differ from Assumptions in that a special effort will be required to ensure their achievement (they cannot be presumed to exist) and address such requirements as system responsiveness, capabilities, and cost effectiveness in relation to mission essentiality.

Furthermore, the LOGPLAN contains ninety-two Specific Objectives and one hundred fourteen Implementing Actions within fifteen different functional areas.

Specific Objectives are intended to concisely, and quantitatively, where possible, set forth systems improvement goals. They describe, and specify the expected impacts on DOD-wide systems responsiveness and efficiency.

Implementing Actions are listed after the Specific Objective they support. The Implementing Actions include analysis to determine effective and efficient policies, systems, and

procedures based upon consideration of mission accomplishment, system performance, resource expenditure, and risk.

The Specific Objectives and Implementing Actions then, are deemed the keystone to LOGPLAN's effectiveness. These elements are in particular, based on proposals for needed or improved systems originating in the Office of the Secretary of Defense, the Military Departments, the Office of the Joint Chiefs of Staff, Defense Supply Agency, or other DOD components. Such proposals will also be developed further for LSPC consideration by one of the LSPC's permanent or ad hoc organizational entities.

III. METHOD OF DEVELOPMENT

A. THESIS OBJECTIVE

Having defined the objective of the thesis to be the development of a model to construct an interfunctional network for the implementation of the DOD LOGPLAN, an assessment was made regarding the magnitude of the project.

The assessed scope of the project was determined to be the development of a relative network arrangement of all the one hundred fourteen implementing actions. In many cases, the IA's within functional areas, seemingly bore no particular relationships other than being categorized into the same particular functional area. Compounding this problem was the lack of any apparent relationships between the fifteen separate and different functional area IA's. However, the network developed

would necessitate taking into consideration the possible affects each of the implementing actions would have on all implementing actions.

B. MODEL DEVELOPMENT

In developing a model to interrelate LOGPLAN's 114 IA's, several alternatives were investigated. In reply to the request from the Office of the Chief of Naval Operations [Ref. 14], the writers expressed their interest in developing an interfunctional network as a directed study. Therefore, the model of using two students alone to investigate the relationships between the 114 IA's was an initial alternative. However, there was the potential that the magnitude of the undertaking would be excessive.

Another alternative model was that of soliciting the assistance of U. S. Naval Postgraduate School Professors to investigate the relationships. Associated with this alternative was a funding requirement since considerable time would be required for their involvement.

Finally, an alternative considered was that of augmenting the two students already involved under a directed study with additional U. S. Naval Postgraduate School students. Associated with this alternative was the potential for greater indepth analysis at no additional cost.

Upon investigating the alternatives, the following conclusions were made. The limited knowledge and experience level of the two writers was considered inadequate to accomplish such a project alone, especially in view of time constraints.

To accomplish the project within a few months time frame, it was determined that additional research assistance would be required, preferably with a high degree of expertise peculiar to the functional areas contained in LOGPLAN. Furthermore, funds for the involvement of Professors in the project were not available. Therefore, the writers decided to solicit assistance from the only immediate resources available, an augmentative student group from the Naval Postgraduate School.

Ideally, it was thought that the augmentative group of students needed to fortify the efforts of the Material Management writers of this thesis would include:

-One Operations Research/Administrative Science (OR/AS) student,

-One Financial Management student,

-One Systems Acquisition Management (SAM) student,

-One Maintenance (1520 Navy designator) student, and

-Two additional Material Management students.

Students meeting these criteria were deemed to more than likely possess certain expertise and qualifications peculiar to the composite of functional areas contained within LOGPLAN.

In soliciting the assistance of a student group, the writers were unable to obtain the services of an OR/AS student and a SAM student, as originally intended.

Instead, the writers were able to select the assistance of:

-One Financial Management student,

-One Maintenance (1520 Navy designator) student and,

-Five additional Material Management students, each possessing different specialities in logistics.

A brief resume of background qualifications of the augmentative group of students selected appears in Appendix A.

C. FUNCTIONAL AREA ASSIGNMENTS

The writers then assigned functional areas to the selected students based upon their particular qualifications and level of experience. It was envisioned that these study assignments would reduce the magnitude of the project as a whole, by allowing students to concentrate more fully in particular segmented portions of the project. These assignments of the functional areas to the students are also included in Appendix A.

Each student was furnished a copy of the LOGPLAN Profile, the LOGPLAN itself, and a copy of Appendix B, the LOGPLAN Action Schedule [Ref. 13, Part II], which provides a synopsis of the subject matter for each Implementing Action. Additionally, all background and current status information germane to the IA's within his assigned functional area was provided. This was done in order to provide each student with all information available upon which he could base his decisions. A request was made of each student to assimilate all information pertinent to his particular functional area and then, make a judgement as to the most logical relative ranking he would assign the implementing actions within his functional area. This included taking into consideration the affects each IA imposed on the other implementing actions within the same functional area. The writers' purpose in this request was that a logical intra-functional ranking of IA's would provide the basis from which further analysis could be accomplished.

To assist the students in their decision process, a worksheet similar to the one appearing in Figure 4 on the following page was provided. Under the captions "Areas Affected by I.A." and "Prior Accomplishments Necessary," the students were requested to affix comments in their own words as to logical consequences deemed applicable. This was to be performed, taking into consideration the DOD's current logistics system. The writers developed this worksheet as a means to encourage the students to verbally justify and record the relationships. Furthermore, the worksheets were an attempt to standardize a basic format from which subsequent analysis could be performed by the group as a whole.

D. INTRAFUNCTIONAL PERT NETWORK ANALYSIS

Once students had relatively ranked and assigned priorities to the IA's within their assigned functional areas, they developed an intrafunctional Program Evaluation and Review Technique (PERT) network diagram. The PERT network would best portray the graphic representation of the intrafunctional ranking of IA's. Also, the PERT network would standardize data for subsequent analysis.

Upon completion of the intrafunctional PERT network diagrams, students were requested to orally present their constructed networks to the group. The intention here being that the implications of each IA and their logical development of the PERT network could be explained to the group as a whole. Furthermore, this phase would afford group familiarity with the other functional areas as well as provide constructive

FIGURE 4

STUDENT WORKSHEET

SPECIFIC OBJECTIVE_____

IMPLEMENTING ACTION_____

SUBJECT:

AREAS AFFECTED BY I.A.:

PRIOR ACCOMPLISHMENTS NECESSARY:

PRIORITY WITHIN FUNCTIONAL AREA:

JUSTIFICATION:

SOURCE:

criticism prior to group approval of the logical flows developed. The group made their presentations, resolved differences, and confirmed the logical ranking of the IA's within each functional area.

E. INTERFUNCTIONAL PERT NETWORK ANALYSIS

This led to the second phase of the project, that of discussing the interface relationships. During this process, each student again was requested to present to the entire group each of his functional area IA's in their relative order. It was hoped that this process, in particular, would establish interfunctional relationships between IA's. The students in the conduct of this phase proposed relationships, if any, requiring interface between his IA's and the implementing action being described. These relationships were recorded to provide the data for the final phase of the project research.

Using this data, the students determined precedent activities. That is, those students who projected interfacing relationships, determined whether their IA provided an input to, or output from the other related implementing action.

F. ASSUMPTIONS AND BIASES

During these phases, the following assumptions were made:

(1) All IA's, including those not yet approved by LSPC, would be included. This occurred in a few areas where the specific objective had been approved for inclusion in LOGPLAN and its associated IA was anticipated, pending DOD component approval.

(2) Priority was placed on those IA's that would eliminate duplication of future study group efforts on subsequent IA's.

(3) Domestic logistics goals would be accomplished prior to expansion into the worldwide arena.

These assumptions were made to provide logical consistency throughout the input/output analysis.

In any research effort, biases are likely to exist. In a military study, biases could materialize in a number of areas. Age, rank, or previous experience are examples. Furthermore, alliance to the views of one's parent DOD component can present a possible bias. These particular biases were minimized wherever possible in this research effort in that objectivity was stressed as being the singular avenue from which the students were to base their decision. An academic environment, in this case, was deemed to be a facilitating factor in promotion of the desired objectivity. The aforementioned biases did not appear prevalent possibly because the study group conducted their activities in an arena of academic freedom.

G. DATA BASE FOR MASTER NETWORK

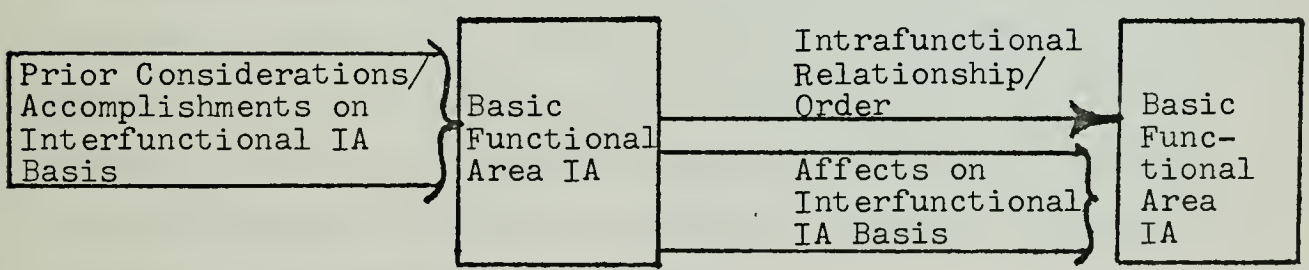
Because of time constraints, this concluded the research group's efforts. All inputs to their particular IA's were recorded on their functional area PERT diagrams to provide the data for the development of the master network.

These diagrams reflected intrafunctional priorities and interfunctional inputs. The writers then performed two steps: (1) interpreted the basic IA as being an output for each particular input IA and, (2) recorded that relationship for each input IA on its functional area PERT diagram. This resulted

in the input/output networks for each functional area which are arranged alphabetically in Appendix C. On these networks, the number, followed by a letter, refers to the established designation of the particular IA within its functional area. A condensed summary of the subject matter for each IA appears in Appendix B.

Each of the fifteen functional area diagrams appearing in Appendix C portrays by directional arrow flow, the relative ranking of the IA's within that particular functional area. Also, any ultimate interface relationships the basic IA's might have with IA's from the other functional areas are indicated.

While any intrafunctional relationships between the basic functional area IA's are depicted by a progressive arrow flow chain, any interfunctional relationships are shown by input and output flows to the left and right of each basic IA. Interpreting these networks can best be described by the diagram below:



Those Interfunctional IA's appearing to the left (Prior Considerations/Accomplishments) of each basic functional area IA represent interface relationships in terms of ultimate affects to the basic IA as a result of their execution. Likewise, those

interfunctional IA's as well as the basic intrafunctional IA's appearing to the right of each basic IA represent ultimate affecting relationships as a result of the basic IA being executed.

Therefore, the data presented in Appendix C provides, by individual functional area, an account of any intra- and/or interfunctional relationship deemed to exist for those IA's within each functional area. This portrayal of IA relationships among each functional area constituted the basic skeleton framework from which the writers proceeded to construct a master network plan for implementation of the one hundred fourteen IA's. The development and results of the master network construction is the topic of the following chapter.

IV. RESULTS

A. MASTER INTERFUNCTIONAL PERT NETWORK

Appendix D is the culmination of the thesis effort. It is the overall schematic of those interfunctional relationships depicted in Appendix C. Since Appendix C portrayed the seemingly simple and direct affecting relationships, Appendix D was constructed to place into proper perspective the flow of ultimate IA relationships. As such, it shows the chains of logical progressions for implementing LOGPLAN.

The construction of Appendix D was accomplished using the relationships developed in Appendix C. It was noted in Appendix C that there were numerous IA's that affected many other implementing actions. Likewise, singular relationships existed.

The objective was to interrelate all 114 implementing actions. To accomplish this, the numeric representation of each IA was placed on one inch by one inch cards on a twelve foot table. Singular relationships were placed together on the initial display.

Subsequent attempts at displaying relationships incorporated those IA's which affected many other functional areas. This process required many attempts at "trial and error" in displaying those IA's which affected a significant number of other IA's.

At this point, the interfunctional display incorporated approximately 25% of the 114 IA's. The next iteration was to expand the diagram to be all-inclusive. This was accomplished by adding, on a case by case basis, related IA's to those already shown. The result was an expanded diagram, both horizontally and vertically.

B. VALIDITY TESTS

Upon placement of the 114 IA's, the entire process was performed again to test the validity of the representation. Each functional area PERT chart in Appendix C was compared with the diagram to insure order preserving relationships had been maintained. This provided repetitive checks on input, output, and intrafunctional relationships.

Since this process was accomplished using only the numerical representation of the IA, the writers then performed a test of the logical order using the verbal substance of the IA. Each

IA on the diagram was reread to insure that relationships existed with its associated IA.

It was discovered that when inconsistencies were evident, changes could be made in the diagram without altering the entire network. Such inconsistencies could occur as a result of misinterpretation of the IA or in differences in opinion as to logical relationships. The arrow display of relationships could readily be added to, or deleted from, the network when additional relationships were discovered or proposed relationships were deemed not to exist. However, in effecting any of the changes, the aid of Appendix C was necessary to prevent the inadvertant omission of displaying all of the subsequent IA relationships.

The assumption was made at this point that there would be the necessity of continuous feedback throughout the stages in the network. Where applicable, precedent activities would have to be informed of the output of any subsequent activities where new developments occurred. Since ultimate relationships are delineated in Appendix C, the necessary lines of communication are readily available.

By reading the verbal substance of the IA's in their logical order and assuming continuous feedback throughout implementation, the efficiency of implementing the network became apparent. There were several instances where IA's were obviously dependent on the accomplishment or impact of precedent IA's. In these cases, should task groups be assigned to study the subsequent IA's, any efforts on their part could possibly

result in wasted time and effort. This is because the precedent IA could affect and alter the objective or data base of the subsequent IA. Likewise, a precedent IA could provide guidance and data for many subsequent IA's, thereby reducing the possibility of costly task groups providing redundant study efforts.

It was thereby determined, by the writers, that the master network provided in Appendix D reflects all chains of flows required to logically and efficiently execute each implementing action.

C. INTERPRETATION PROCESS

The master network is read from left to right with activity flow indicated by arrows. The alphanumeric symbols refer to the established IA designations and can be interpreted using Appendix B. On the first quarter of the diagram, two vertical lines are shown with eleven "LD" implementing actions listed between the two lines. The second vertical line provides the boundary after which all LD's, LR's, PI's, and LM's, in part, or in total, are deemed to affect the initiation of all IA's to the right of the second vertical line.

On the last portion of the diagram, there is an additional vertical line which leads to four IA's. The subject matter of these four IA's involves either the worldwide arena or ultimate in logistics development. All other IA's were deemed to affect implementation of these four IA's and thus, are shown as interfaces required, prior to execution of those IA's to the right of the vertical line.

This appendix shows ultimate relationships and all superfluous lines for each affecting relationships have been omitted. This was done to eliminate the confusion of numerous lines being displayed.

To illustrate this process, attention is drawn to FM-2a which can be found in the middle of the third quarter of the diagram. Initial observation leads one to believe that MM-9ab is the only IA that affects FM-2a. However, Appendix C shows that FM-2a receives inputs from MA-7a and MM-9ab. Returning to Appendix D, one notices that there is not a line directly connecting MA-7a and FM-2a. This is because, as shown in Appendix D, MM-9ab interfaces with MM-2ab; MM-2ab is an output of MC-4b; MC-4b is affected by MA-1a; and MA-1a interfaces with MA-7a. Therefore, even if the direct relationships may not be obvious at first glance, they are ultimately reflected on this master network.

This master network displays the overall relationship between the IA's and their relative position. It is order preserving and ultimately, depicts all relationships, both intra- and interfunctionally of the 114 implementing actions contained in LOGPLAN.

V. CONCLUSIONS AND RECOMMENDATIONS

The major conclusion of this thesis is that an interfunctional network plan for the implementation of LOGPLAN's 114 IA's can be developed by employing the method of approach discussed herein. The master network, developed as a consequence

to this particular model, allows for an order preserving intra- and interfunctional relative position of each IA. Accordingly, adoption of this method of approach as an approved means towards development of an interfunctional network for the efficient implementation of DOD LOGPLAN, is recommended.

The master network plan presented in Appendix D represents a synthesis of Naval Post Graduate School students' research efforts. As such, the logical flows of IA's portrayed might be debased by the limited experience level of the students involved with the construction of the network. Therefore, it is recommended that the master plan be reviewed for logic by "highly qualified logisticians," and as a result of their review, be used either in entirety or as a fundamental structure from which the DOD LOGPLAN can efficiently be implemented.

Although insufficient time has elapsed for the indepth analysis recommended, an initial review has been conducted by the Office of the Chief of Naval Operations and their response has been received by the U. S. Naval Postgraduate School [Ref. 27]. The letter states that:

1. "the network logic appears well organized," and
2. "Preliminary analysis indicates a considerable effort and imaginative planning on the part of the participants."

This, in itself, lends support to the writers' opinion that the method of developing an interfunctional network as described in this thesis is logical and sound.

An inherent advantage of the master plan presented in Appendix D is its flexibility to change. Since its construction is based simply on relative order of IA input and output flows,

minor adjustments to the plan can be performed by the redirecting of these flows. Even if major adjustments are required, the same concept of relative order of IA input and output flow will still enable the plan to reflect its designed purpose . . . an efficient progression plan for implementation of the DOD LOGPLAN's 114 implementing actions.

It is recommended that foremost consideration be given to the master network in Appendix D when decisions such as IA and task group study assignments are to be made. Upon assignment of study groups, the individual functional area networks displayed in Appendix C are then deemed beneficial in terms of ascertaining explicit IA relationships. The ultimate IA interfaces shown in these suboptimization stages are (1) more readily apparent than those same ultimate IA interfaces portrayed in the master diagram and (2) in that format, they lend themselves to individual analysis and in-depth review.

A conclusion that follows is that cost effectiveness could be better achieved by following the master network in Appendix D as a guide in the implementation of DOD LOGPLAN. This master network is designed to (1) provide progressive and confirmed data bases from which subsequent IA's in the network can be implemented, (2) allows for possible consolidation of associated IA's for task group study assignments, and (3) reduces duplication of efforts involved in the studies of subsequent implementing actions. The writers' recommend that Appendix D be followed with these cost effectiveness measures incorporated, wherever possible.

Finally, in critique of the writers' selected method for the development of the interfunctional network, it is concluded that the method provides a logical and analytical framework for systems analysis. This particular methodology allows for the expertise and objectivity deemed essential for development of a complex network such as that presented in Appendix D.

In retrospect, time was a factor which definitely led to a change in the method of development itself. Initially, it was intended that the augmentative student group would participate in all phases of the interfunctional network construction; however, the augmentative student group was disbanded prior to completion of the project as was discussed in Chapter III. At that point, the writers assumed the responsibility alone for construction of the overall network in Appendix D. Accordingly, testing of logic and revisions found necessary, were made through value judgements of the two writers.

Had sufficient time been available, it is felt that the validity of the master network could have been insured to a greater degree with the group, as a whole, overseeing its construction.

In similar respect, group interface with those logisticians intimately involved with LOGPLAN, would have been most beneficial during the final phase of the master network construction. Had this opportunity availed itself, mutual concurrence regarding IA relationships could have been refined to the fullest measure.

By and large, these contingencies could have reduced significantly, those constraints mentioned in Chapter I.

APPENDIX A

RESUMÉS OF AUGMENTATIVE STUDENT GROUP

FUNCTIONAL AREA		
Financial	Graduate Major:	Financial Management
	Navy Designator:	3100 (Supply Corps)
		Rank: LCDR
	Prior Experience:	Navy Finance Office
		Disbursing Officer
Logistics Design Logistics Research		
	Graduate Major:	Material Management
	Navy Designator:	3100 (Supply Corps)
		Rank: LCDR
	Prior Experience:	Inventory Control
		Requirements Determination
		Supply Systems Analyst
		Ammunition Project Manager
Material Management Supply Management		
	Graduate Major:	Material Management Aeronautical Engineering
	Navy Designator:	1320 (Navy Flight Officer)
		Rank: LT
	Prior Experience:	Avionics Officer - A-6 Squadron
Movement Control Transportation	Graduate Major:	Computer and Material Management Aeronautical Engineering
	Navy Designator:	1310 (Navy Pilot)
		Rank: LT
	Prior Experience:	A-6 Pilot - Squadron Operations, Maintenance, and Administration billets

Maintenance	Graduate Major:	Material Management
	Navy Designator:	1520 (Aeronautical Engineering Duty Officer for Maintenance)
		Rank: LT
	Prior Experience:	18 years aviation maintenance Maintenance Control Officer
Procurement	Graduate Major:	Material Management
	Navy Designator:	3100 (Supply Corps)
		Rank: CDR
	Prior Experience:	Contracting Officer (3 tours) Field Procurement Assistance Officer
Technical Data Weapons Systems	Graduate Major:	Material Management
	Marine Corps Designator:	7565/7595 (Helo Pilot)
		Rank: LCOL
	Prior Experience:	10 years Weapons Systems Procurement

APPENDIX B

SYNOPSIS OF IA SUBJECT MATTER

LOGPLAN NO.	SUBJECT
DO-1a	Establish Doctrinally-Oriented Logistics Research Offices
FM-1a	Develop Compatible ADP Stock Fund Accounting and Reporting Systems
FM-2a	Review of industrial fund inventories and their supply support
FM-3a	Establish Criteria for determining Sale of Stock Fund material to contractors.
FM-3b	Seek Legislative Authority to sell Stock Fund Material to Contractors
FM-4a	Develop uniform cost accounting standards and definitions
FM-4b	Revise and Reissue DOD Instructions 7220.29
FM-4c	Development of Joint Depot Cost Accounting Manual
FM-4d	Develop and test system to accumulate cost data below depot level LAW DODI 7220.29
FM-5a	Design New Logistics Systems to be Compatible with Financial Systems
FM-6a	Review Financial and Supply Systems to provide Maximum Financial Flexibility

LOGPLAN NO	SUBJECT
LD-1a	Coordination of LOGDESMO mission with Management Programs
LD-2a	Increased emphasis on MILS
LD-3a	Selection and use of Standard Programming Language for Modeling
LD-3b	Use COBOL Programming Language for New Logistics Systems
LD-5a	Use Standard Programming Packages in Common Functional Applications
LD-6a	Development of comprehensive standard DOD-wide Logistics Terminology
LD-7a	Telecommunication, ADP Systems Designers, and Logistical Functional Managers Participate and Coordinate through Logistics Systems Life Cycle
LD-8a	Ensure Logistics Systems are designed as networks
LD-8b	Ensure Logistics Systems are designed as networks
LD-9a	Require Telecommunications, ADO Systems and Logistic Functional Managers to Participate in Systems Development Decisions
LD-10a	Ensure Conversion of Logistics Data to Automated state at the Point of Origin

LOGPLAN NO	SUBJECT
LD-12a	Develop Standard Warehousing and Shipping Automated Systems
LD-13a	Establish an LSCRG
LM-1a	Develop Items on Educational Program for LOGPLAN
LM-2a	Develop Items on Educational Program for LOGPLAN
LR-1a	Initiation of Priority Systems Studies, Technical review of LSPC sponsored studies and avoidance of study duplication through enhanced visibility
LR-1b	Alternative Funding Mechanisms for LSPC Sponsored Studies
LR-2a	Avoid duplication of previous studies
LR-3a	Review Logistics Study Systems, using AR 5-5 as a Reference
LR-4a	Prepare a catalog of current Logistics Research models
LR-5a	Maintain Mechanism for Effective Management of Studies
LR-6a	Army Resubmit Proposed for Expansion of DLSIE to the Status of a Logistics Information Center
LR-6b	Components Provide DLSIE with more comprehensive and Timely Inputs

LOGPLAN NO	SUBJECT
MA-1a	Design/Develop Item Characteristic Model
MA-2a	Develop Economic Airlift Eligibility Criteria
MA-3a	Study Changes necessary in UMMIPS
MC-1a	Explore/Test New Technology to Identify/Record Shipments Processing Throughout Terminals
MC-2a	Study the Transportation Control Number
MC-2b	Extend MILSTAMP Overseas
MC-3a	Study GBL Format
MC-3b	Components update DOD Activity Address Directory with APOD's and CONUS Break Bulk Points
MC-3c	Develop a Transportation Data Segment to the Master Item Data File (MIDF)
MC-3d	Enter Transportation Data into the MIDF for New Items in Stock in CONUS Storage Sites
MC-4a	Military services and DSA continue Internal Development of Intransit Visibility System
MC-4b	DOD Intransit Item Visibility Data Bank
MM-1a	Develop requirements for equipment and work force performance data systems

LOGPLAN NO	SUBJECT
MM-1b	Assure current data systems and procedures meet requirements of equipment and workload performance
MM-2a	Develop and publish integrated Logistic Support Implementation guide
MM-2b	Assure parameters for support to weapons systems are established early
MM-3a	Review repair level techniques and systems
MM-3b	Develop techniques for optimum repair level analysis
MM-4a	Management of the modification of equipment in the DOD operational inventory
MM-4b	Develop methods and procedures to validate maintenance changes or modification
MM-5a	Analyze and refine tech data and publications
MM-5b	Establish procedures for improved maintenance tech data
MM-6a	Maintenance Functional Managers will actively participate in development of a Standard DOD-wide Logistics Terminology
MM-6b	Develop Instructions on Application and Use of Common Maintenance Criteria and Data

LOGPLAN NO	SUBJECT
MM-8a	Develop automated systems for programming depot maintenance workload
MM-9a	Review industrial standards and establish procedures to facilitate use
MM-10a	Define "Repair Expenditure Limit"
MM-10b	Develop and publish repair expenditure limit criteria
MM-11a	Review Interservice Maintenance Interrogation System (ISMIS)
MM-11b	SISMS revised to facilitate interservice maintenance agreements
MM-12a	Task JLC to establish permanent panel to jointly review Military Department requirements for tooling, equipment and test equipment
MM-13a	Test the award and administration of selected contracts
MM-14a	Establish procedures to coordinate new commercial techniques

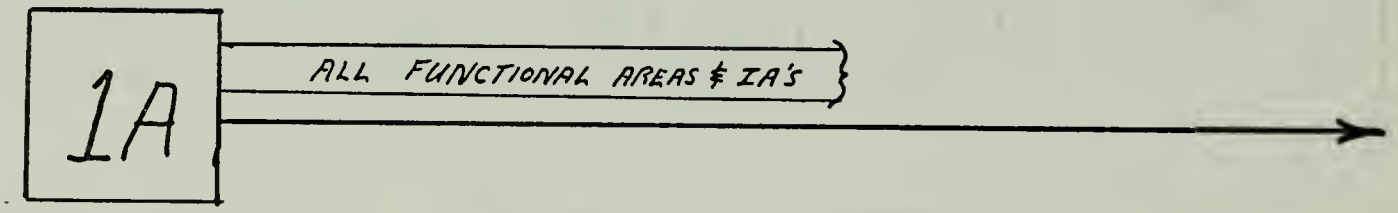
LOGPLAN NO	SUBJECT
MM-14b	Identify areas needing research that inhibit readiness
MM-15a	Conduct a Review of Military and Civilian Education Programs
MM-16a	Develop a career program for equipment maintenance
MM-17a	Establish program readiness objectives in maintenance
MM-18a	Look into phased maintenance support
MM-18b	Prepare guidance for application and use of phased maintenance support
PR-1a	Recommend changes to improve the procurement organization
PR-2a	DOD Procurement Research Committee Identify Resources to devote to Procurement Problems, Exchange Procurement Programs and Coordinate Procurement Research
PR-3	Study existing and proposed automated Procurement Systems
PR-4a	Defense Procurement Career Management Board Review and Update Procurement Career Development

LOGPLAN NO	SUBJECT
PR-5a	Develop a Basic Life Cycle Costing Methodology for Major Systems Acquisitions
PR-6a	Cost Estimating Review Groups in OSD and All Components strive toward Development of Uniform Cost Estimating Criteria
SM-1a	Develop Standard Documentation/Reporting Procedures for Weapons System Manager/Item Manager and Depot Interface
SM-2a	Components use Variable Demand Criteria and Explore Reparable Generation vice Demand for Reparable Items
SM-3a	DOD Advisory Group for Secondary Item Requirements Computation Process
SM-4a	DOD Advisory Group for Secondary Item Requirements Develop Item Range/Depth Criteria
SM-4b	Improvements in Provisioning Decisions
SM-5a	Develop Standard Formats Terminology and Procedures in Reporting Assets and Usage Data
SM-6a	OASD (I&L) publish a Standard Procedure for Critical Item Management

LOGPLAN NO	SUBJECT
SM-7a	Design Develop Item Characteristic Model
SM-8a	DOD Advisory Group for Secondary Items Identify Program Data required to compute ICP Requirements
SM-8b	Determine cost effectiveness of flowing program data to item managers for a larger range of items
TD-1a	Develop Standard Technical Data Numbering and Indexing Systems
TD-2a	Develop a Defense Technical Data Information System Network
TR-1a	Develop DOD Surface Container-Supported Distribution System
TR-2a	Develop DOD Air Container-Supported Distribution System
TR-3a	Establish Joint Container Steering Group to Coordinate the Development of Surface and Land-Air-Land Container Supported Distribution System
TR-4a	Consider Reduction in Order and Shipping Times in Distribution Studies

LOGPLAN NO	SUBJECT
TR-5a	Minimize Overall Distribution Costs
TR-7a	Incorporate Transportation and Inventory Analysis for effective Interaction among supply, Procurements, Maintenance, Transportation, and Financial Systems
WS-1a	Identify Program and Technical Data required for each level of Management/and type items for which such data are required
WS-2a	Identify Program and Technical Data required for each level of Management/and type items for which such data are required
WS-3a	Develop Standard Elements and Codes for Program and Technical Data
WS-4a	Criteria for Authorization of Weapons Systems Management to Establish Dedicated Logistics Systems
WS-5a	JLC Update and Expand SISMS
WS-5b	Incorporate Standard Integrated Support Management System (SISMS) into DOD Publication

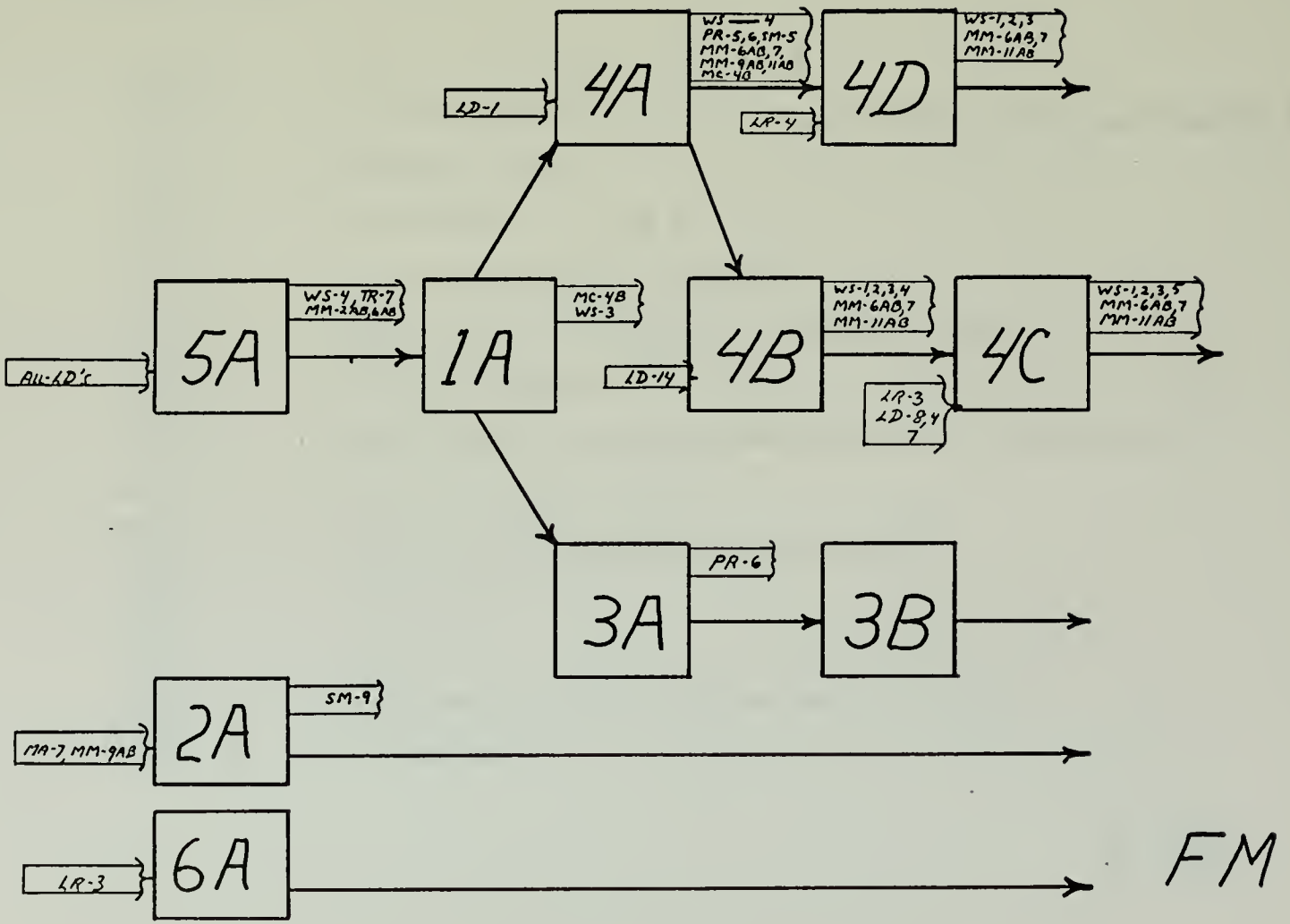
Doctrine



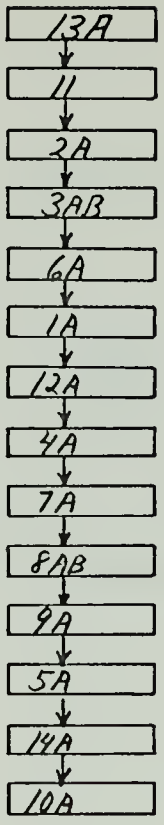
DO

APPENDIX C
INTRAFUNCTIONAL PERT DIAGRAMS INPUT/OUTPUT ANALYSIS

Financial


LD-1
4A
WS — 4
PR-5,6,SM-5
MM-6AB,7,
MM-9AB,11AB
MC-40
4D
WS-1,2,3
MM-6AB,7
MM-11AB
LR-4
All-LD's
5A
WS-4, TR-7
MM-2AB,6AB
1A
MC-4B
WS-3
LD-14
4B
WS-1,2,3,4
MM-6AB,7
MM-11AB
4C
WS-1,2,3,5
MM-6AB,7
MM-11AB
LR-3
LD-8,4
7
3A
PR-6
3B
MA-7, MM-9AB
2A
SM-9
LR-3
6A
FM

Logistics Design



TD-1, WS-1,4,5, MA-3A,4A,7A, MM-2A,9AB }

WS-4, MA-3A,4A,7A, PR-2, SM-12A, TR-1,2,3, MM-2A,3A,8,9AB, 11AB, 17AB, 18AB }

MA-3A,4A,7A, PR-2, WS-4,5, TR-3, MM-1AB, 2A, 11AB, 17AB, TD-1 }

SM-2, TR-7, TD-1, WS-1,2,3 }

SM-6, MM-6AB, TD-1, WS-1,3,4,5 }

FM-4A, SM-8A,6, TR-1,2,3, WS-1,2, MM-2A, 6AB, MC-2A }

MA-6, MM-6AB, WS-1 }

FM-4C, MA-6, PR-2, SM-2,3,6,7, 12A, WS-5, MM-1AB, 2A, 6AB, 8, 17AB }

FM-4C, MM-2A, WS-4, 5AB }

FM-4C, SM-8AB, MM-3A, 8, TD-1, WS-4, 5A }

MC-1A, SM-2, 8, WS-1 }

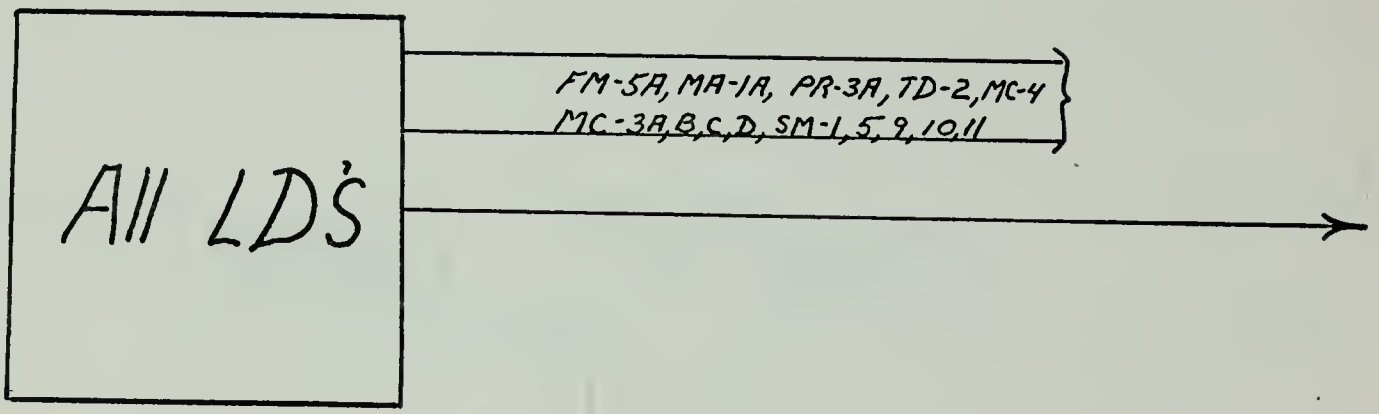
WS-4 }

SM-4,8, MA-7A, MM-3A, 5B, 7(FM-4B), MM-8, 11C, 17AB }

TD-1, MC-1A }

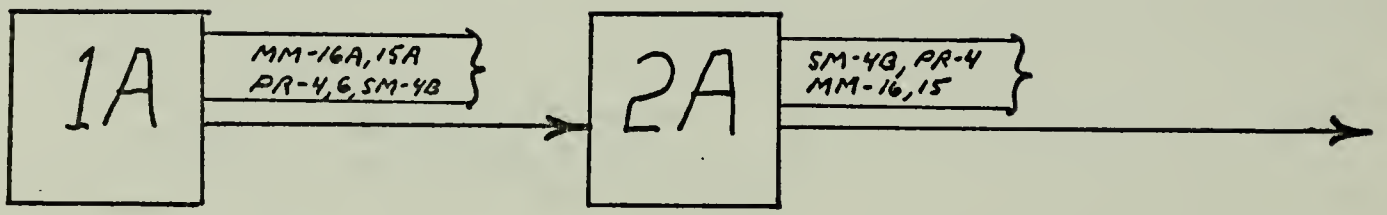
LD

Logistics Design



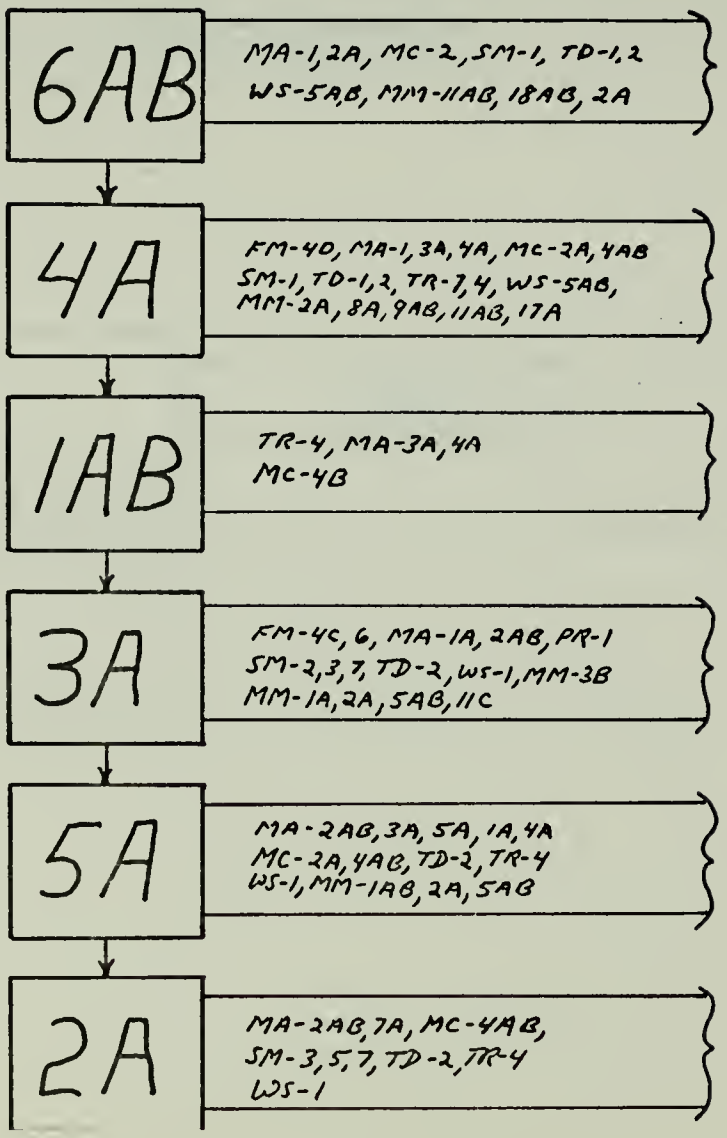
LD

Logistics Manpower



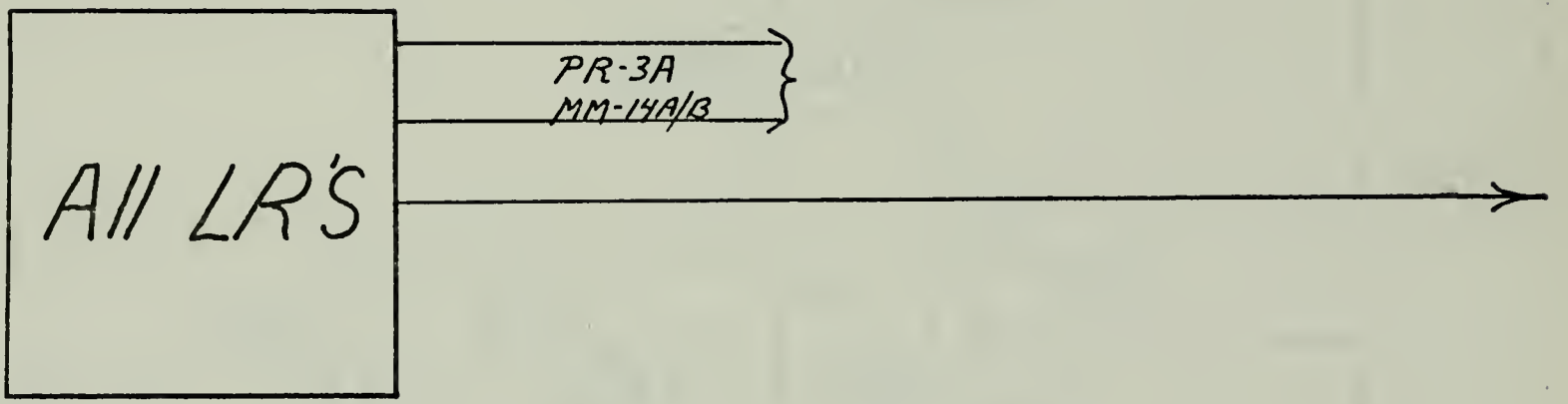
LM

Logistics Research



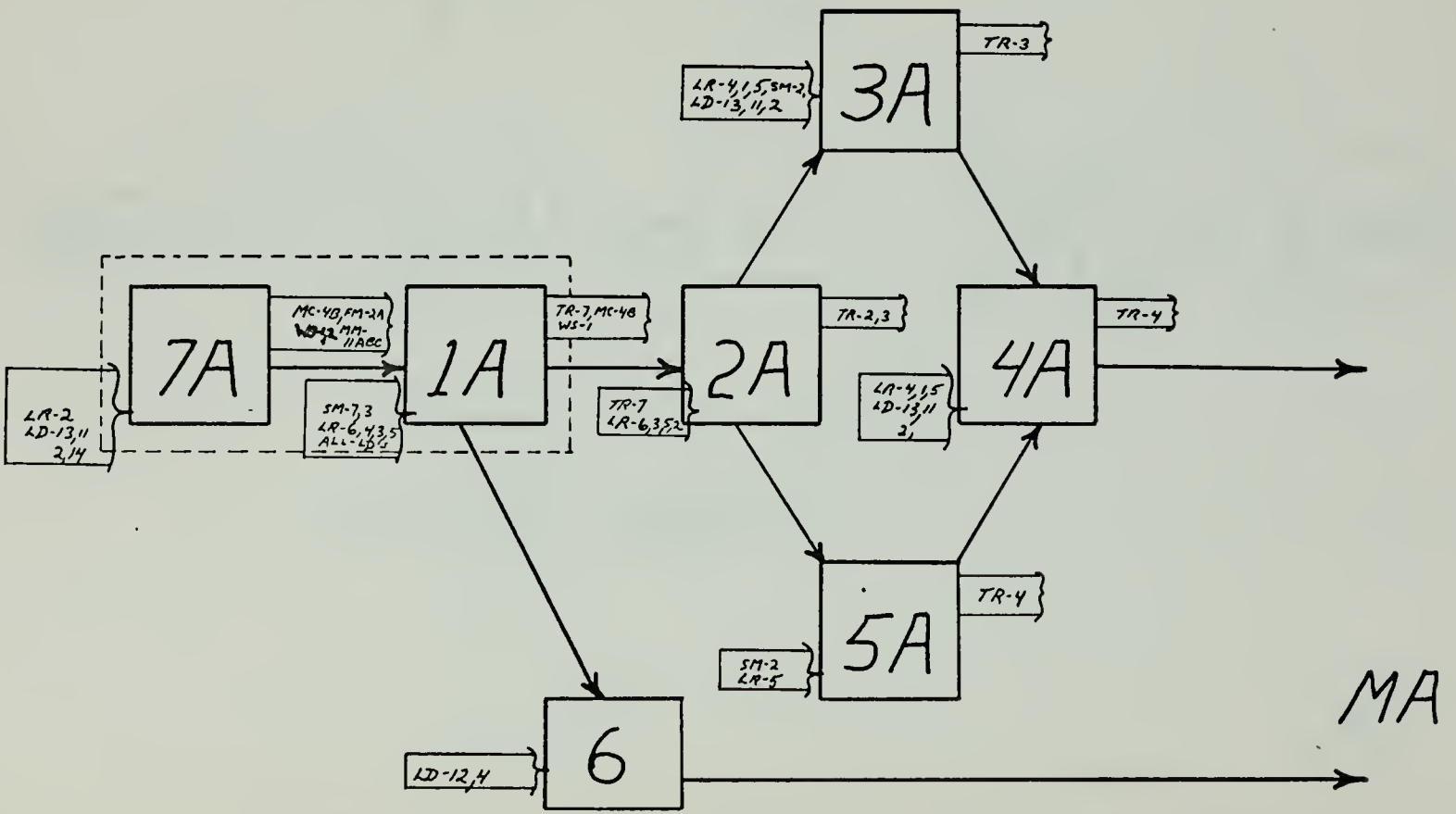
LR

Logistics Research

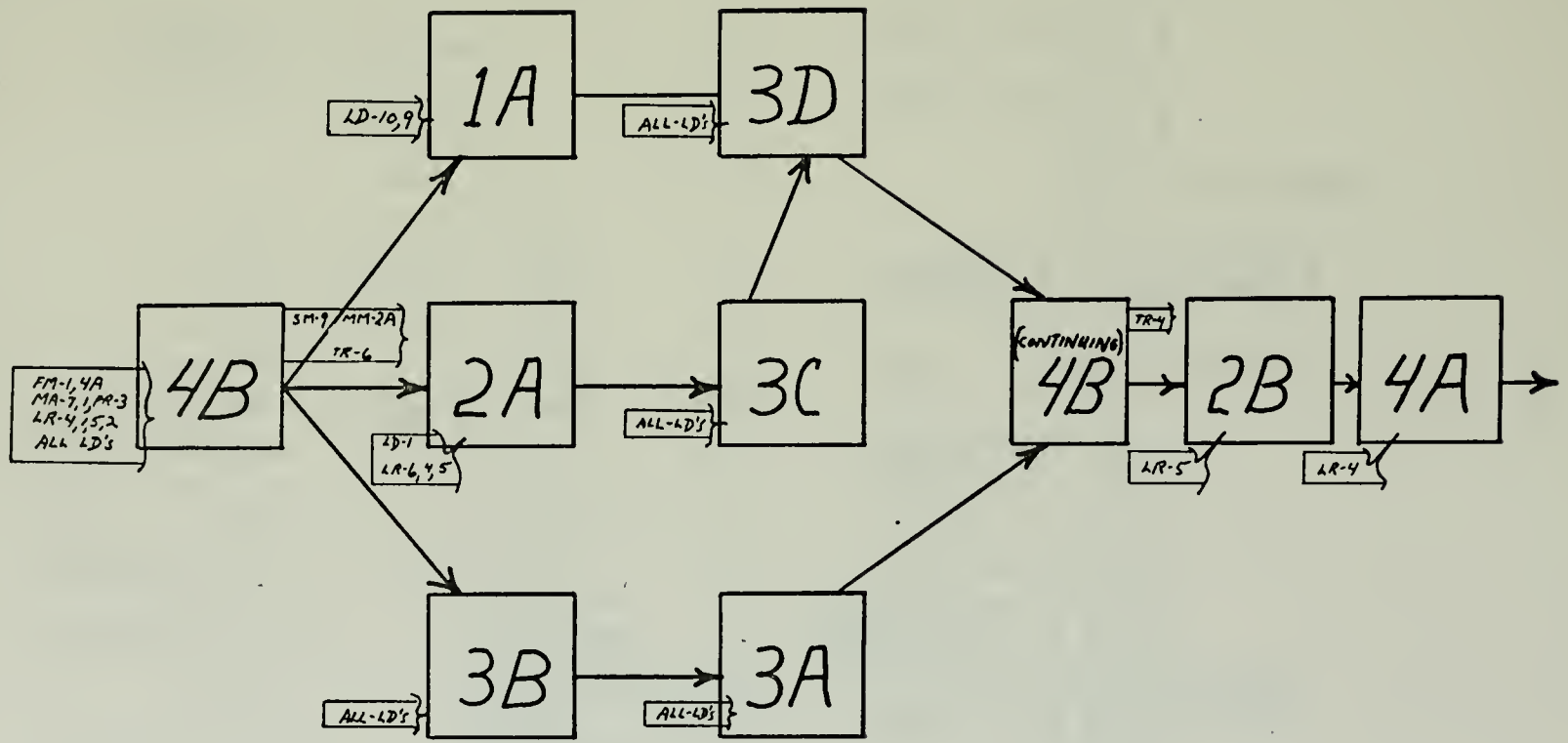


LR

Material Management

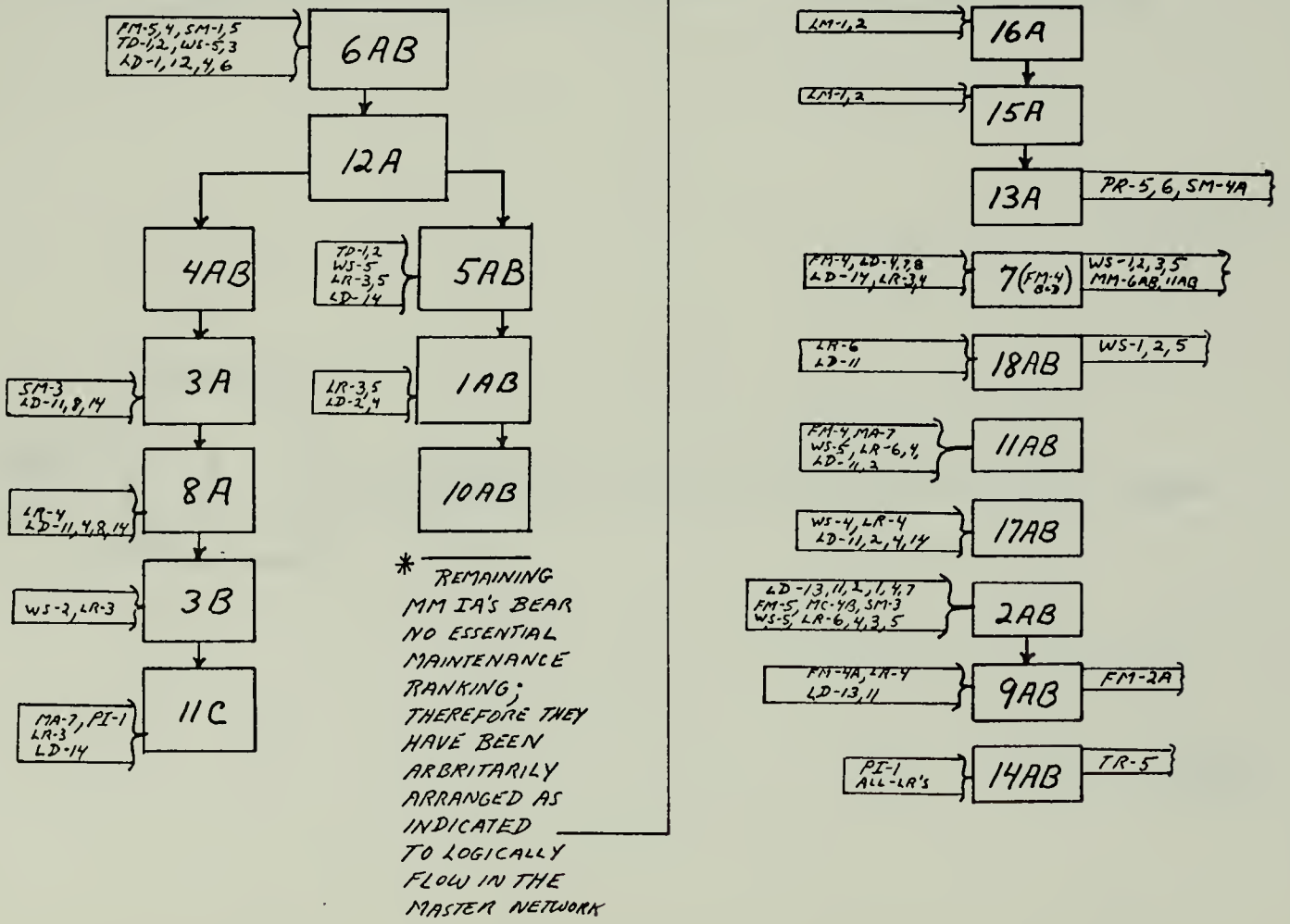


Movement Control



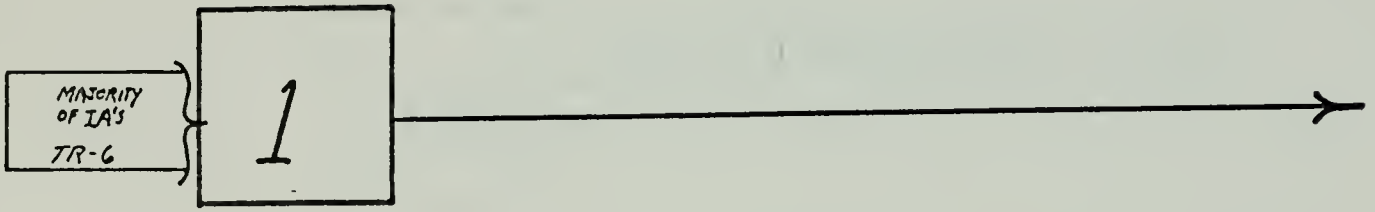
MC

Maintenance



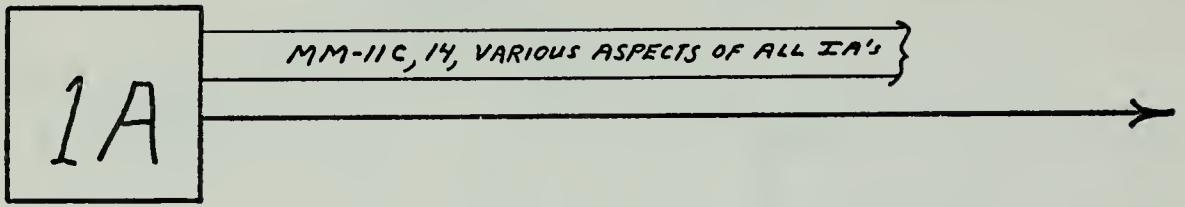
MM

Organization For Logistics



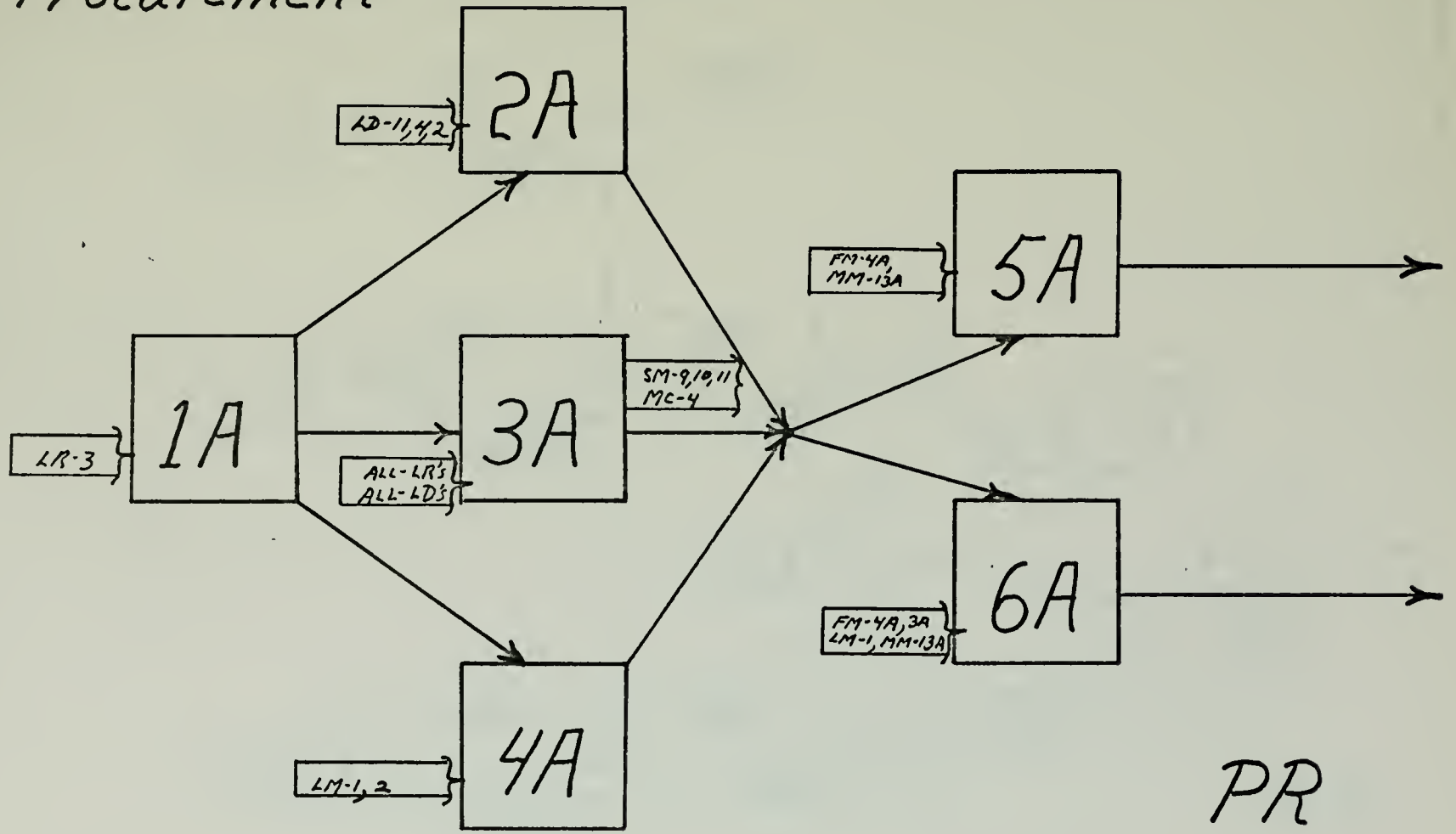
OL

Productivity



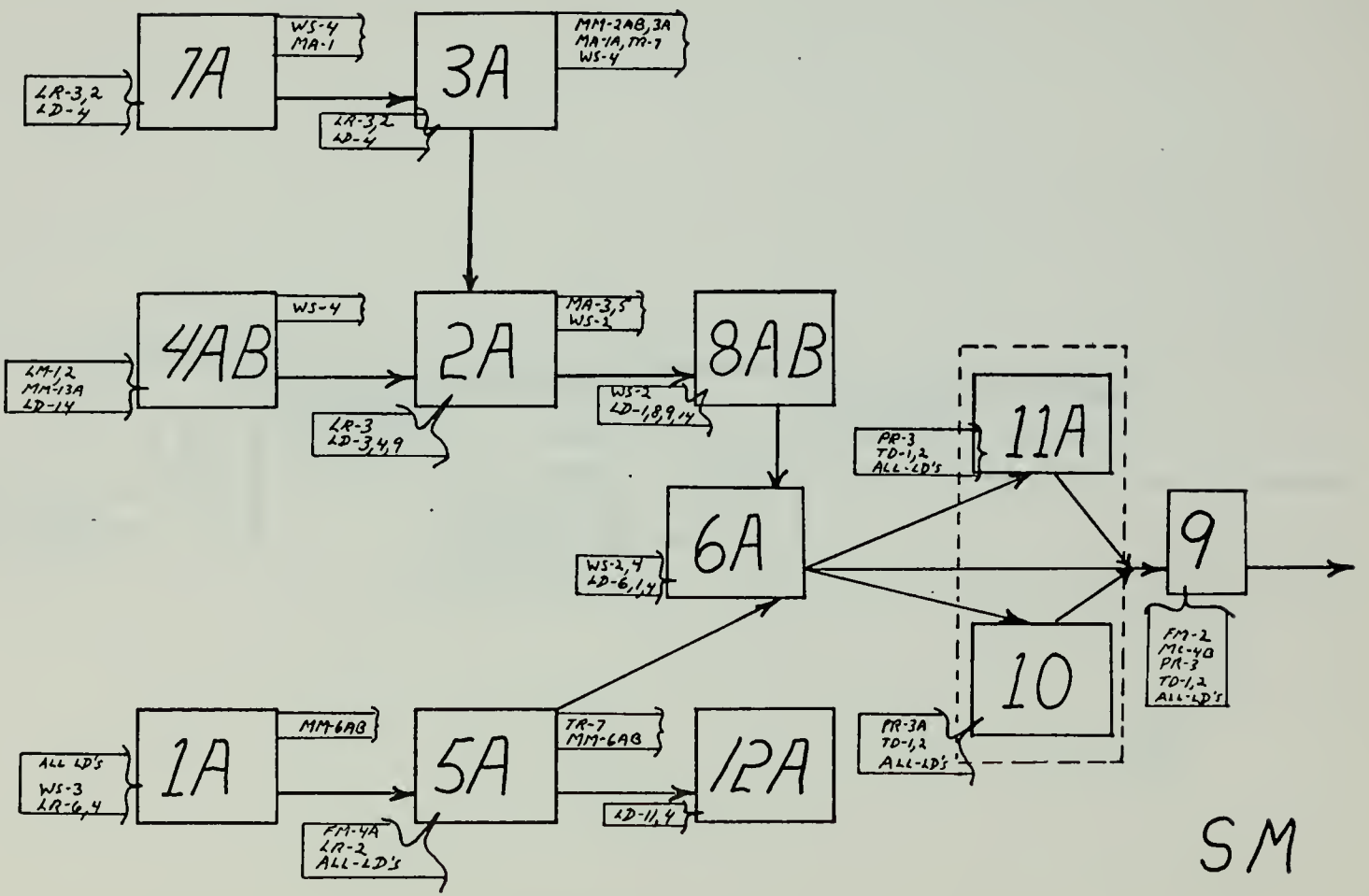
PI

Procurement



PR

Supply Management



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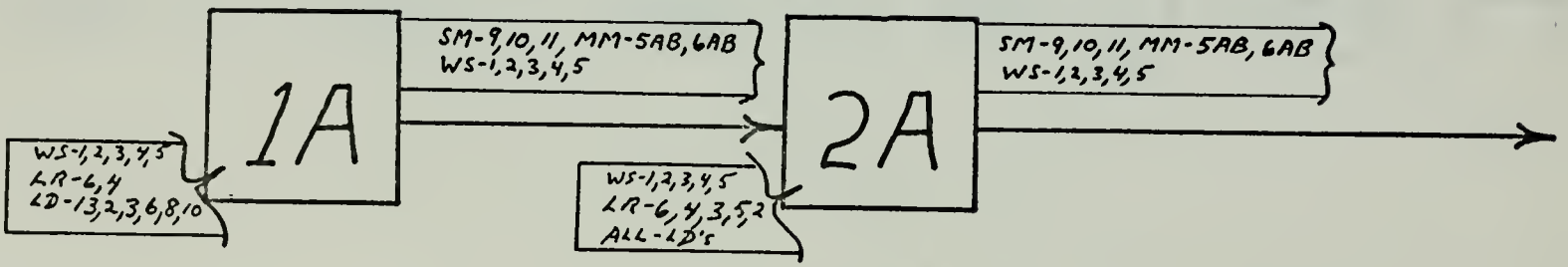

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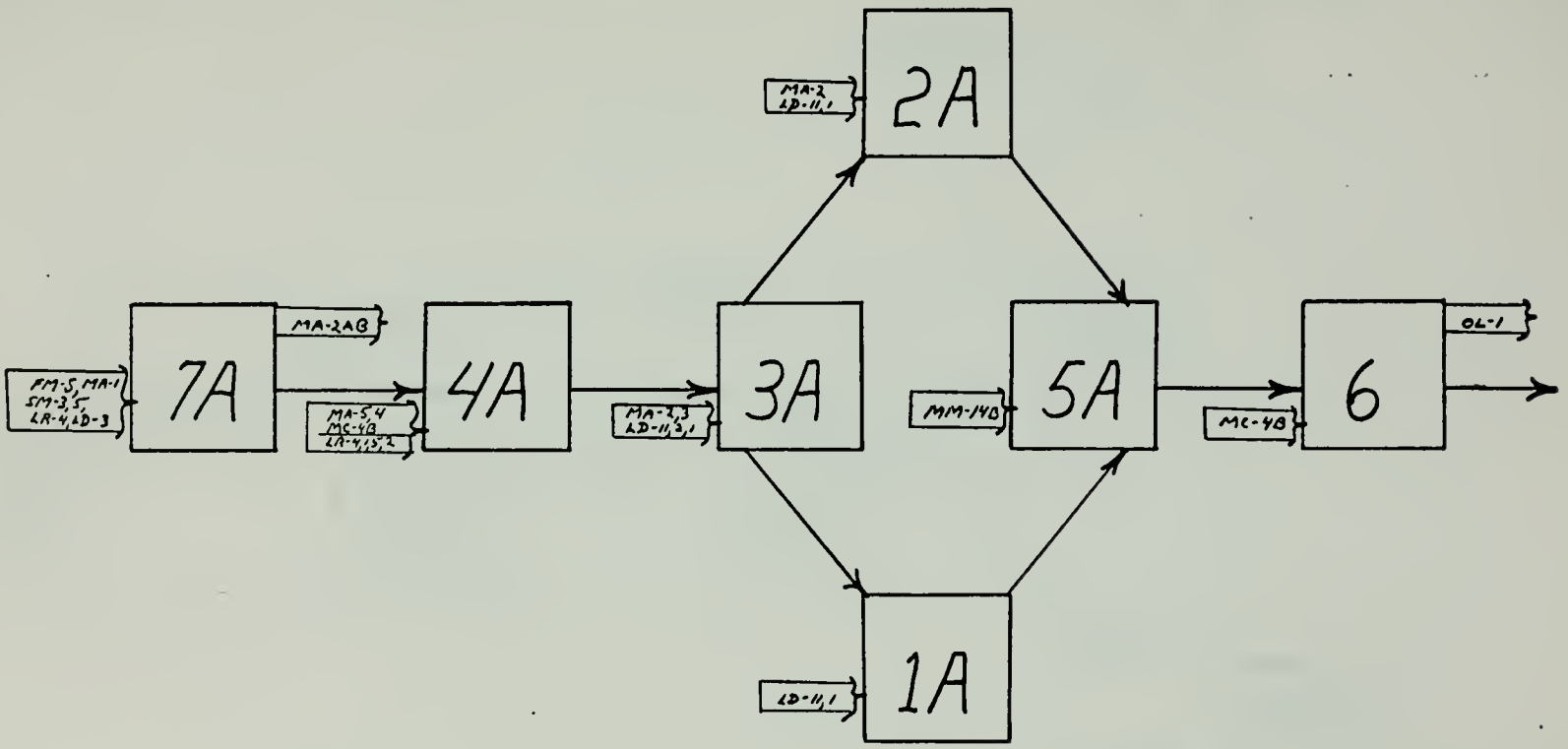
Transportation



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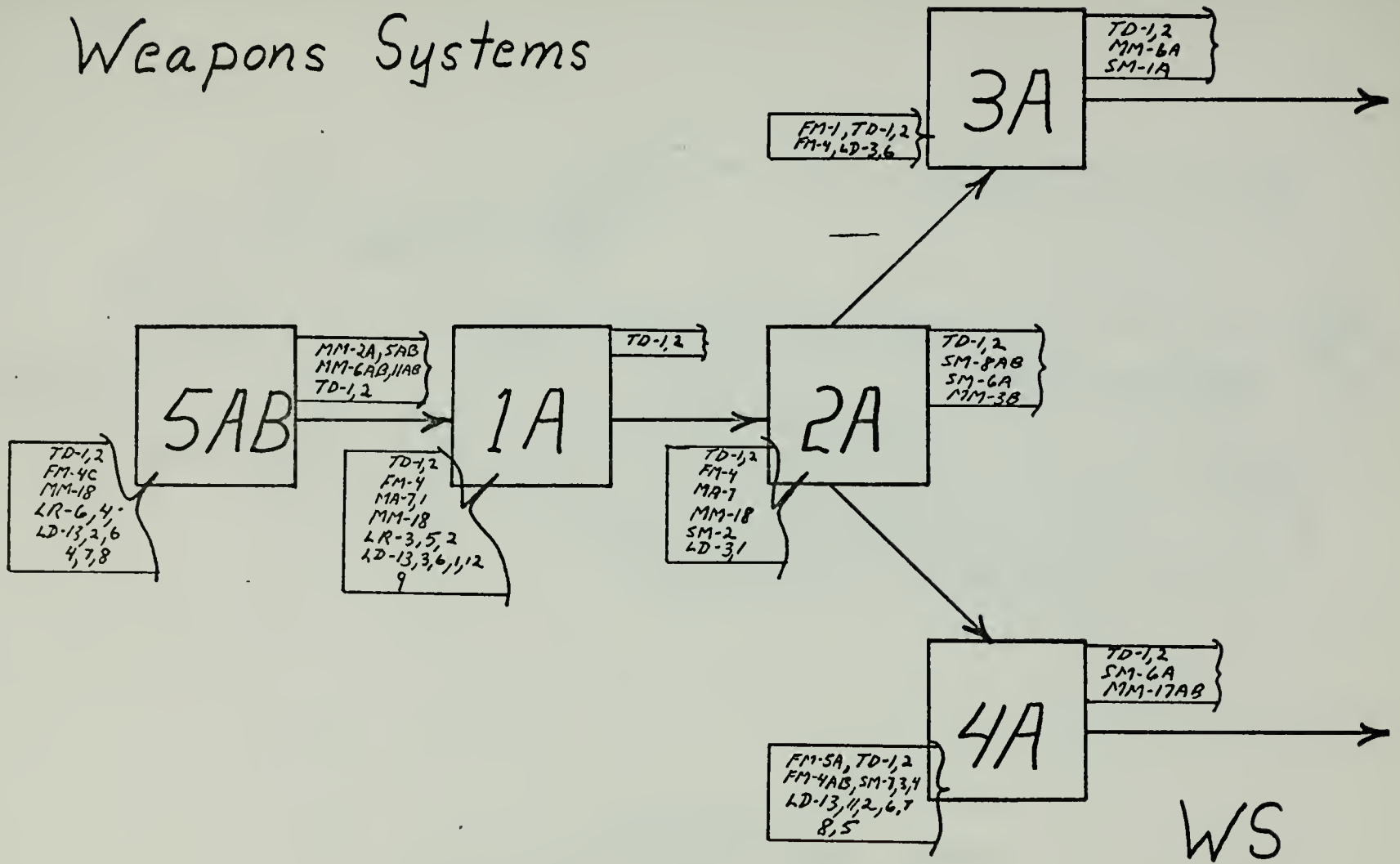
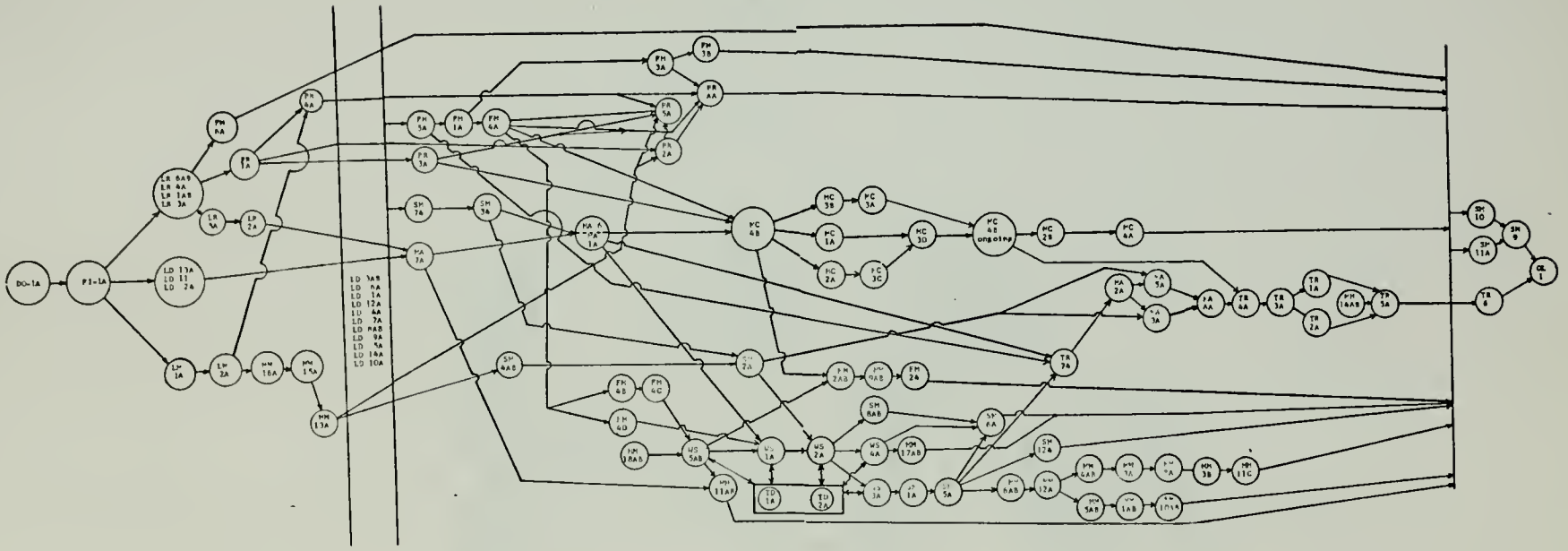
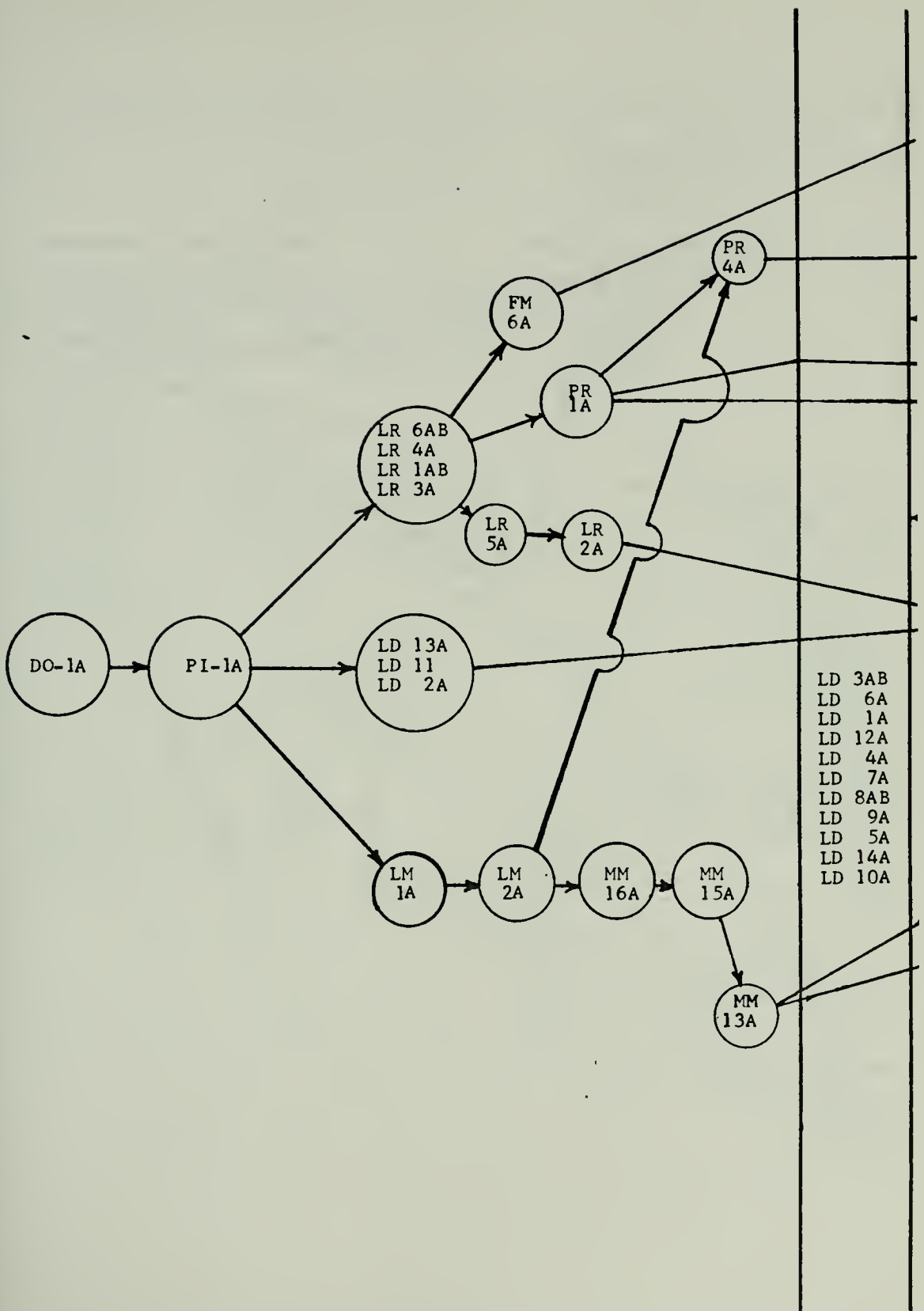




APPENDIX D
MASTER INTERFUNCTIONAL NETWORK DIAGRAM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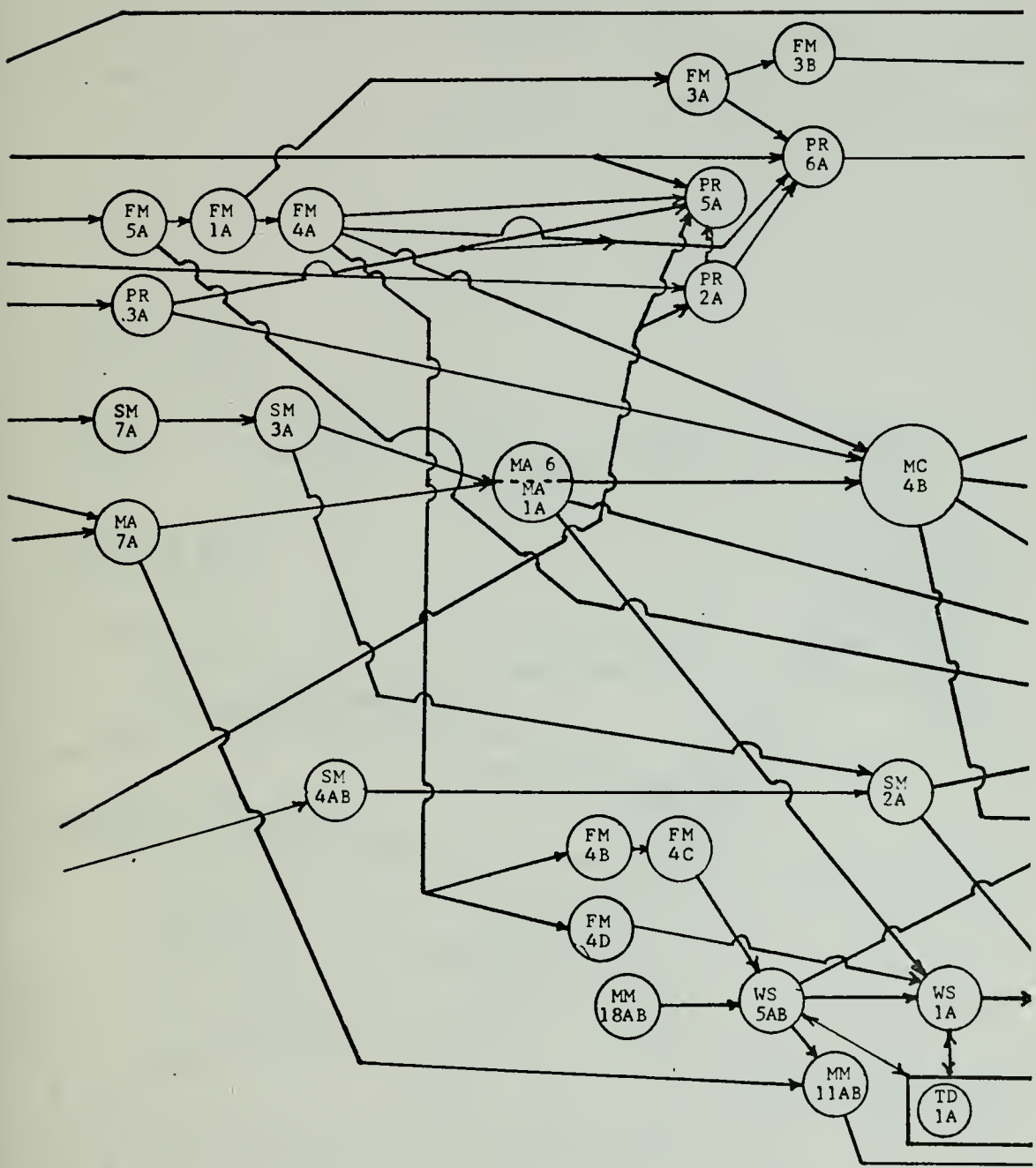
PI-1A
LR 6AB
LR 4A
LR 1AB
LR 3A
FM
6A
PR
1A
PR
4A
LR
5A
LR
2A
LD 13A
LD 11
LD 2A
LM
1A
LM
2A
MM
16A
MM
15A
MM
13A
LD 3AB
LD 6A
LD 1A
LD 12A
LD 4A
LD 7A
LD 8AB
LD 9A
LD 5A
LD 14A
LD 10A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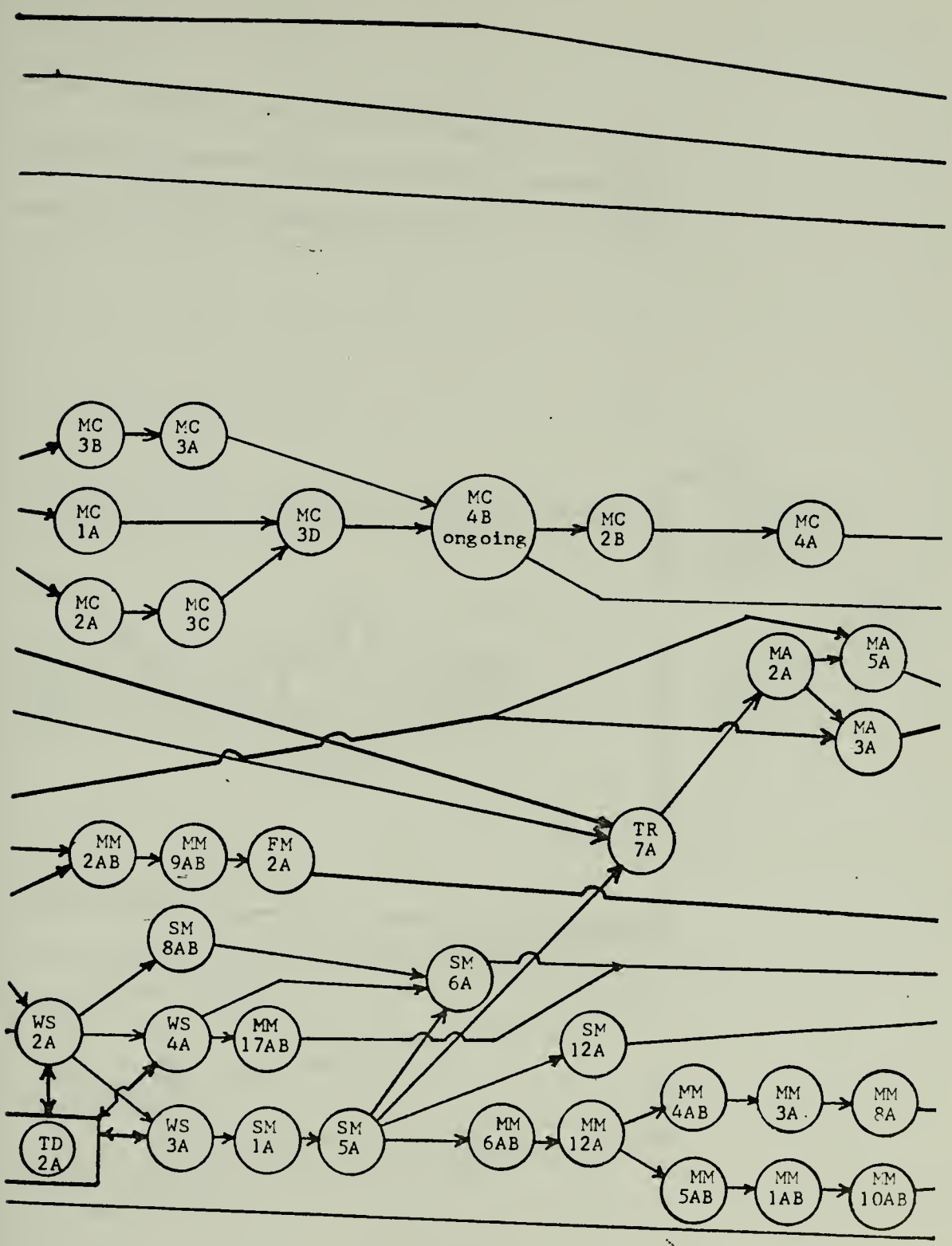
PR 6A
PR 5A
FM 5A
FM 1A
FM 4A
PR 2A
PR .3A
SM 7A
SM 3A
MA 6
MA 1A
MC 4B
MA 7A
SM 4AB
SM 2A
FM 4B
FM 4C
FM 4D
MM 18AB
WS 5AB
WS 1A
MM 11AB
TD 1A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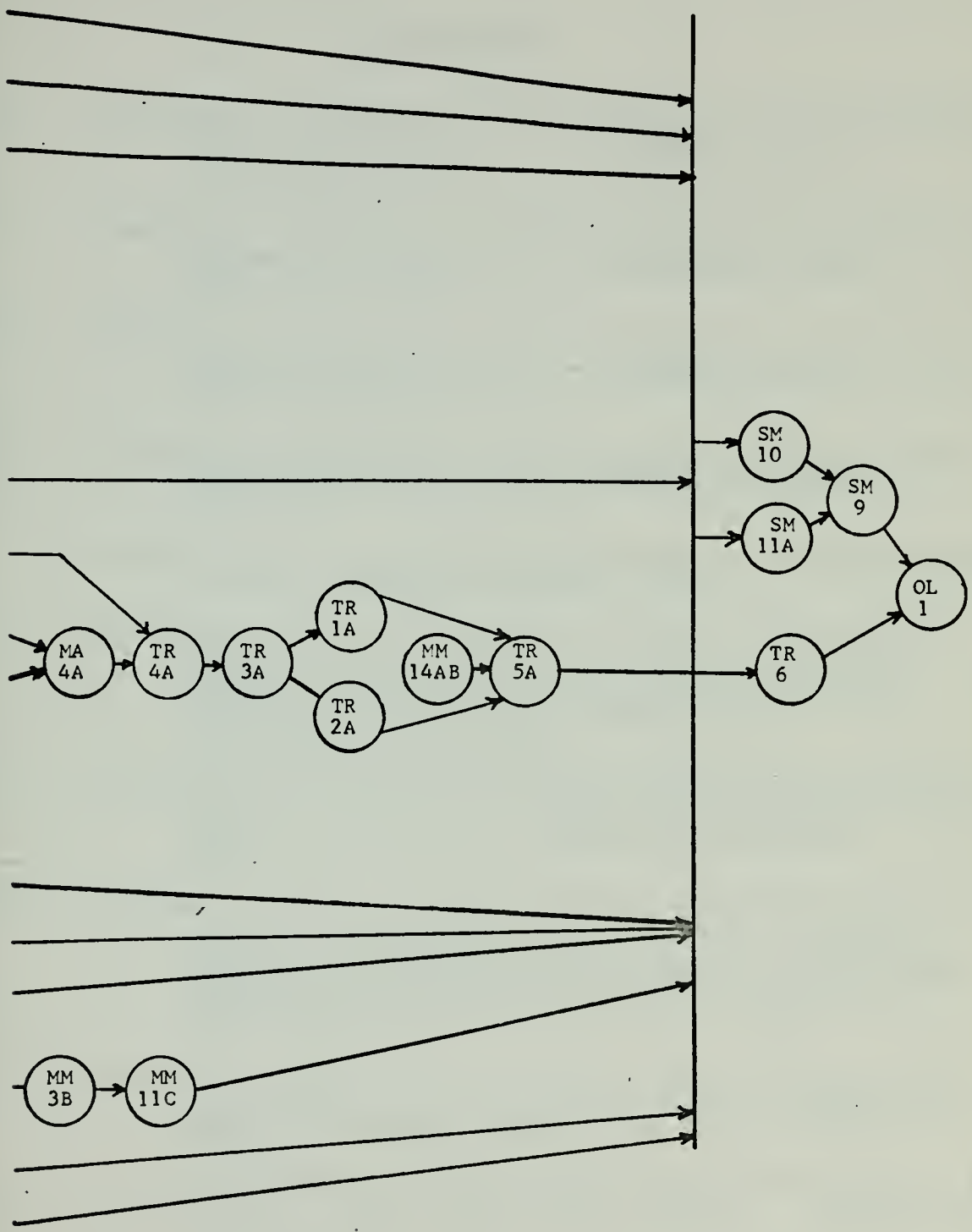
MC 3A
MC 1A
MC 3D
MC 4B ongoing
MC 2B
MC 4A
MC 2A
MC 3C
MA 2A
MA 5A
MA 3A
TR 7A
MM 2AB
MM 9AB
FM 2A
SM 8AB
SM 6A
WS 2A
WS 4A
MM 17AB
SM 12A
MM 4AB
MM 3A
MM 8A
TD 2A
WS 3A
SM 1A
SM 5A
MM 6AB
MM 12A
MM 5AB
MM 1AB
MM 10AB


SM
10
SM
9
SM
11A
OL
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TR
1A
MA
4A
TR
4A
TR
3A
MM
14AB
TR
5A
TR
6
TR
2A
MM
3B
MM
11C

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